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# COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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## S/370 Virtual Memory Software Almost Ready?

By Don Leavitt  
Of the CW Staff

CAMBRIDGE, Mass. — Time-sharing, virtual memory software for the 370 apparently will be publicly announced before the end of the summer.

Four volumes of "Alpha Documents" describing Control Program 370 and the subsystem Conversational Monitor System were recently distributed for internal evaluation by IBM's CP-67/CMS Development Group, headquartered here.

If the documentation is accepted by the reviewers, public announcement of the software can be expected sometime in the second or third quarter of this year, perhaps as early as April 30, according to well-informed, but non-IBM industry sources.

An IBM spokesman refused to "speculate" on development efforts and would say only that neither program had been announced "yet."

### Simulation System

Control Program 370 is apparently an updated version of CP-67, a simulation system that runs on the 360/67, under which the user builds a virtual 360 with any size memory he wishes, regardless of the size of the real machine. I/O channels, tape drives and disk units can also be defined as part of the virtual machine, but only if they exist in the real machine.

Because the CP user has his own virtual machine, he may use any operating system he wishes, including DOS, OS or the logically simple one user-one task

monitor system. Operating system and user programs are organized into "pages" by the control program to fit into the available real memory.

If paging and virtual machine logic becomes generally available, IBM will have a means of moving users up to OS and away from DOS without requiring a lot of real core, an industry observer noted. The long-awaited Advanced Operating System (AOS) may well combine the simulation capabilities of Control Program 370 with the best of the current Operating System, he said, and may be available by the end of next year.

Control Program 370 contains at least 10 of the  
(Continued on Page 3)



### Caravan Hits N.Y.

New York and other users take a look at the sights on the exhibit floor of the Middle Atlantic Computer Users' Forum and Exposition. Story and other photos on Page 4. (CW Photo by V.J. Farmer)

## Tymshare 'Ring' Network Called More Dependable

By a CW Staff Writer

PALO ALTO, Calif. — Tymshare Inc. has completed implementation of a master software program to locate and use alternate circuits in case of line failure in the 40,000 mile "ring" of leased telephone lines, interconnecting 22 CPUs that make up its Tymnet data communications network. The result, according to industry sources, is a virtually "fail-safe" operation.

Another feature that sets the network apart from other commercially available time-sharing services is the specialized mini-computers to insure good data transmission. The only comparable system, according to Tymshare, is the Arpa network of the Department of Defense.

While the combination of the ring of leased lines and hardware gives Tymnet what one industry source calls a "rock solid" configuration for data, implementation of a Network Supervisor System (NSS) program was re-

quired to bring all of the equipment under effective control, according to Tymshare.

Tymnet has both DEC PDP-10s and XDS 940s installed. Under NSS, the user can access many identical CPUs, in case one becomes unavailable, or access different types of hardware to meet differing needs.

While the choice of CPU is controlled by the user, through his choice of "user name," the locating and switchover to alternate circuits, in case of failure on the main route between user and CPU are handled by the NSS software, without requiring user intervention or knowledge.

Because Tymnet provides access to all of its CPUs from any point on the ring, a data base for multiple locations can be established in any given CPU. The data base can also be copied, on a daily or immediate basis, to a second CPU if such backup is required, Tymshare said.

(Continued on Page 3)

## IBM Offers 3705 TP Controller At 13% Discount on Fixed Lease

By Ronald A. Frank  
Of the CW Staff

WHITE PLAINS, N.Y. — IBM has announced a programmable communications front-end processor that can operate with all 370 CPUs and most models of the 360 family.

The 3705, officially called a communications controller, greatly expands the capabilities of the 270X Series. The 3705 can be used with most IBM terminals.

Significantly, IBM plans to offer 24-month contracts on the 3705 at a 13% discount. Previously IBM offered a "fixed-term plan" for tape and disk systems which gives users an option of 12- or 24-month contracts. With the new extended-term plan the minimum contract is 24 months, an IBM spokesman said, with 12-month renewals as an option.

### Line Access Tasks

The 3705 can be programmed to perform many line access and data gathering tasks formerly handled by the CPU. For example, the 3705 can be programmed to store, decode and assemble data coming in from remote terminals, before releasing them to the main processor. The 3705 can continue receiving data from remote terminals during interruptions in CPU operation. The controller has a storage capacity of 16K to 240K characters available in 32K increments.

An emulation program enables users of 2701, 2702 and 2703 transmission control units to run existing 360 and 370 programs "without change prior to upgrading," IBM said.

The 3705 requires only one address on a sub-channel, while earlier IBM controllers occupy a separate sub-channel address for each line, IBM said.

The 3705 can correct "intermittent transmission errors" using automatic error recovery

procedures. The controller can be equipped to switch to a second CPU channel for emergency backup and the 3705 can be linked to two CPUs, IBM said.

A Network Control Program (NCP) provides 3705 users with

message access and control capabilities that previously had to be handled by the central processor. The controller's internal programming is supported by the Telecommunications Access  
(Continued on Page 3)

## IBM—Data Recall Dispute Seen Near Compromise

By E. Drake Lundell Jr.  
Of the CW Staff

WHITE PLAINS, N.Y. — IBM has agreed that a redesigned interface for Data Recall extended memories may solve the maintenance problem.

Earlier IBM told some users that the installation of Data Recall core in excess of specifications had made IBM maintenance of their CPUs "impractical," but rescinded that order until the outcome of a suit filed by Advanced Memory Systems [CW, Mar. 1].

Data Recall demonstrated a prototype of the redesigned interface for IBM at Bridgeport (Conn.) Hospital, one of the users which had received notification that maintenance would be impractical.

In a letter to Computer Investors Group, Inc., which markets the Data Recall units, H.W. Stigler, IBM director of business practices, said: "If your design changes result in your being able to restore the machine, whenever maintenance is required, to a condition similar to that which we inspected at Bridgeport Hospital . . . I believe you will have solved the problem."

Since the unit inspected at Bridgeport was just a mockup of the redesigned interface, however, Stigler noted that IBM would have to evaluate an actual installation on a 360/30 "for the purpose of making a final deter-

mination as to the practicality of IBM maintenance."

The redesign includes adding a switch to the unit, so that the extended memory above 64K can be "patched out" while the rest of the system is being tested. This allows IBM to run all of its diagnostics without problems, Data Recall said.

To date, Data Recall has only demonstrated a prototype of the changes, but it expects to have the first redesigned interface installed for IBM inspection by June 1 and plans to retrofit all

(Continued on Page 3)

### On the Inside

Special Report: Flexibility Makes Tape Hard to Beat

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Britisher Claims Secrecy Best Software Protection

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## Computer May Cost \$25 Million

By E. Drake Lundell Jr.  
Of the CW Staff

WASHINGTON, D.C. — "If we allow certain levels of pollution, what will be the ultimate effects on the world's climate and oceans?"

"I'm planning a vacation in three weeks. What type of weather can I expect in downtown Burbank?"

These are two questions — one deadly serious and the other somewhat frivolous — the Department of Commerce hopes to answer with the aid of a new super computer now under development.

The system, called the Advanced Scientific Computer, is being developed for the National Oceanic and Atmospheric Administration (NOAA) by Texas Instruments, Inc., for a total price tag which may run as high as \$25 million, easily making it the most expensive, even if not the most advanced, computer in use.

The new environmental computer system, which Commerce Secretary Maurice H. Stans calls 10 times more powerful than any com-

puter system now commercially available, will be used to aid scientists in the study of the behavior of the world's weather and oceans.

"These studies should give us a predictive capability to provide reliable guidance in the management and protection of the environment," Stans said announcing the project.

"We can expect that the effects of pollution on the ocean and atmosphere and on the climate can be anticipated, thus permitting a larger portion of our research to be knowledgeably directed toward changes induced by man's activity," he added.

The system will be used to simulate the circulation of the air and the sea and the interactions between them more accurately than now possible, Commerce said.

The system, which will initially rent for \$4.5 million per year, is scheduled for installation in mid-June 1973 at NOAA's Geophysical Fluid Dynamics Laboratory on the Forrestal Campus at Princeton University.

## The first compact data storage system to combine tape economy with disc performance.

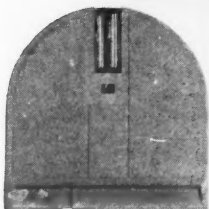
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## On-site Vs T/S? Hospital Panel Says Local Needs Dictate

SAVANNAH, Ga. — Hospitals facing the decision to install an on-site computer or to make use of a time-sharing system should decide on the basis of local factors alone, a panel of hospital executives said here recently.

The panel presentation occurred during the Sixth Seek (System Evaluation and Exchange of Knowledge) Evaluation Seminar.

Panelist Homer Schmitz, executive director of systems, Deaconess Hospital, St. Louis, said hospitals considering on-site versus time-shared computers should review frequency of reports required, compatibility of format with other hospitals, additional support needed and the completeness of the system desired.

His hospital chose on-site DP because it had long-range plans which could not be satisfied by a time-share system; greater flexibility was allowed by an on-site computer; human and financial resources were available to purchase a computer and to work out the needed programming and Deaconess administrators had a "liberal attitude" toward innovative hospital problem-solving.

Time-sharing systems were favored by Walter Seligman, administrator, Princeton Hospital, who said they offer hospitals the assurance of "backup" capability in case of equipment malfunction. In addition, no initial cash outlay is necessary, no computer-qualified personnel are needed and no space need be found for a time-sharing system.

Other advantages of time-sharing systems, he continued, include economies which can be effected in ordering supplies, the provision of a common basis for statistical comparisons between hospitals, economies in scheduling and handling data and assurance of interface capability with in-hospital information systems.

Overlook Hospital, Summit, N.J., purchased a computer for its laboratory because its pathologists wanted it that way, said Joseph Fulton, assistant to the director.

"If a hospital pathologist has access to a system whenever it is required, all discrepancies can be checked and proper steps can be taken immediately to insure correct results.

A total laboratory information system most probably would require an on-site computer, said Marian Ball of Temple University Health Science Center. She also cautioned that experience with time-share systems is as yet quite limited, so "hospitals should consider a shared lab system only after careful analysis of the laboratory's actual needs."



## Two Programs Expected

# Is 370 Virtual Memory Software Almost Ready?

(Continued from Page 1)

advanced 370 instructions and has been running on a 370/145 here for several months, according to outside sources. It could be made available for that machine "today," they said.

The companion Conversational Monitor system appears to be a renamed and enhanced version of the Cambridge Moni-

tor System that is often used with CP-67 as interface between the Control Program and the user.

One of the major problems apparently facing IBM is getting the software to work effectively on the cache memory systems of the 155 and 165 models. The efficiency of the high-speed cache or buffer memories is said to drop dramatically

as multi-programming increases.

Even with a single program, the cache operates at only 96% of its rated speed, according to reports, and drops to 75% of its speed when it has to handle five program initiators concurrently. If the pattern holds, cache processing would plummet to only 25% of its rated speed when multiprocessing with as many initiators as CMS would use, one source estimated.

If this is so, IBM won't announce Control Program 370 and CMS for the larger 370s until it can replace the cache memory systems with monolithic memory, he said.

### Narrative Design

Alpha Documents, such as those being reviewed now, are narrative design specifications which spell out the purposes of

the proposed software and the methods by which these purposes are to be achieved.

If the description coincides with what the reviewers expect, the software may then go to Beta test in which IBM tries to insure that the programming does what the Alpha Documents promise. Only after successful Beta tests is software normally considered ready for public release.

An outside factor may affect the release date of Control Program 370 and Conversational Monitor System, according to at least one industry source. Honeywell Information Systems is planning to announce its Multics time-sharing system early this summer. To avoid releasing its functionally similar CP 370/CMS after that, IBM may announce its software at the end of April, even if only for the smaller 370s, he said.

## IBM, Data Recall May Reach Compromise

(Continued from Page 1)

of its 360/30 upgrades by July 1, according to Roger Goetz, vice-president of Computer Investors Group.

The firm is also redesigning the interface for its 360/40 upgrades, Goetz said, but this should not be as difficult as the 360/30 work, since the groundwork has already been started.

The first 360/40 equipped with the new design should also be ready by June 1, he said, with all of the 40 installations equipped with the new unit by July 1.

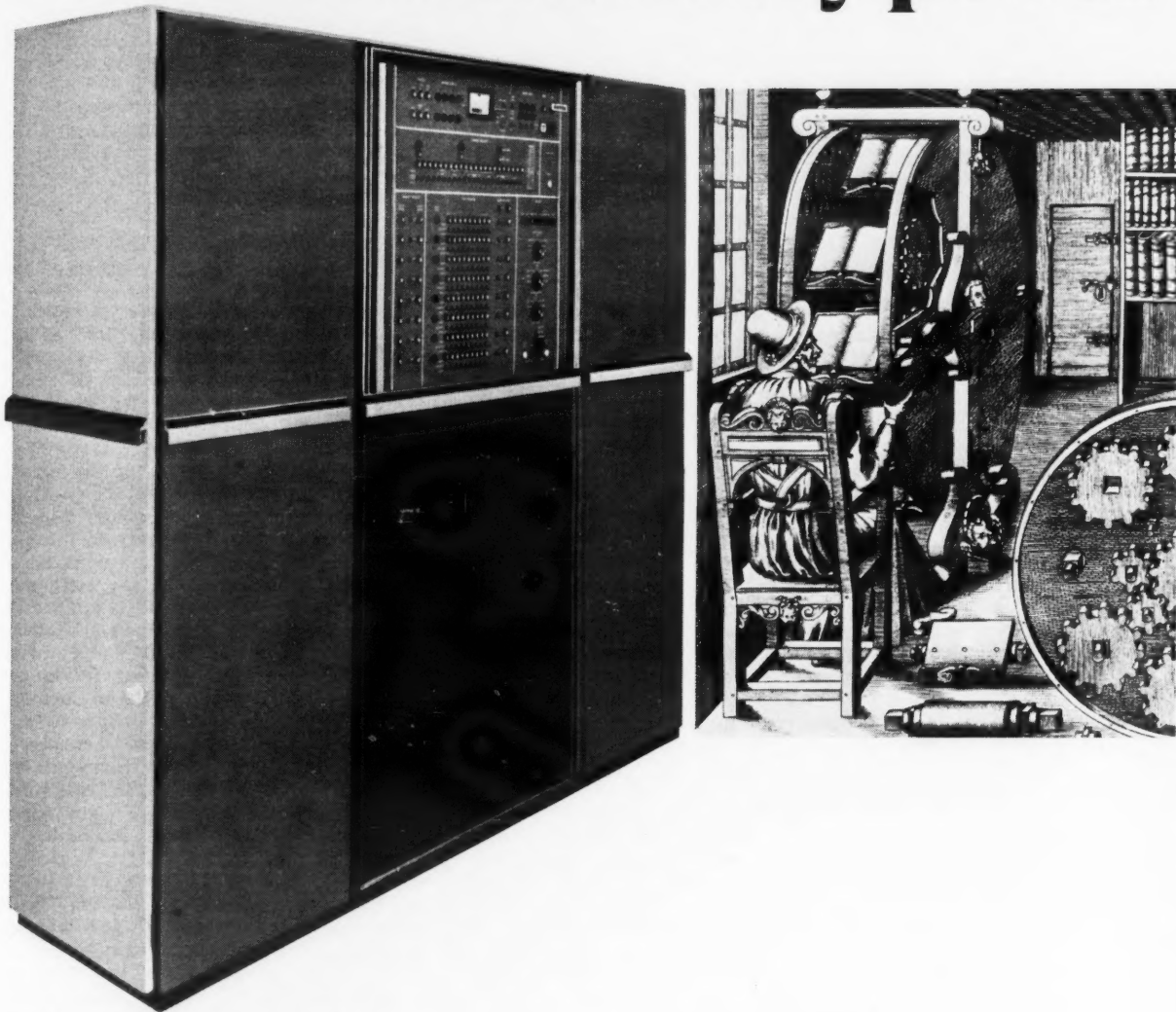
In addition, the firm is now designing an interface for 360/50 upgrades that should meet the IBM requirements, he said. The first 50 upgrade was installed just last week at the Chevrolet division of General Motors, he added.

The 50 upgrade causes fewer changes in the CPU than do either the 30 or 40 upgrades, Goetz said, so an acceptable interface should be designed fairly

quickly after IBM inspects this first installation and outlines any problem areas.

"IBM seems to be more willing to cooperate now than it was before on these changes," Goetz said, indicating that he was optimistic that the difficulties over maintenance would be resolved peacefully and without litigation.

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## Tymshare 'Ring' Net Of Leased Lines Has Master Software

(Continued from Page 1)

Since the Varian 620-based Tysat minicomputers come between the user's own equipment and the Tymnet facilities, the user can utilize many different types of terminal devices with different transmission speeds and codes. The system will support CPU-to-CPU communication but large-scale data transfers are not practical in this mode, Tymshare said, since the highest line speeds supported by Tymnet are 4,800 bit/sec.

In still another respect Tymnet differs from other time-sharing networks by providing for the joint use of its communications facilities. The National Library of Medicine, for example, has connected a 370/155 to the network and its authorized users do not utilize any of the Tymnet CPUs for data processing.

In effect, NLM has created its own network which happens to coincide with Tymnet's. NLM users, however, are billed directly by Bell for their use of the Tymnet lines.

## 3705 TP Controller On Fixed Lease Plan

(Continued from Page 1)

Method (Tcam) and the Basic Telecommunications Access Method (Btam) can be used with the emulation program, an IBM spokesman said. Both NCP and the emulator will be provided without extra cost, he said.

Under the new extended 24-month rental plan, the 3705 will cost from \$1,200 to \$9,500/mo, depending on storage and line capacities. Under normal IBM rental agreement, the 3705 costs about \$1,390 to \$10,940/mo. Purchase prices range from \$57,000 to \$449,000, IBM said. First deliveries of the 3705 and emulator are scheduled for July 1972. The NCP will be available in March 1973, IBM said.



## 'Aggressive,' Independent Users Innovate at Forum

NEW YORK — "More independent" and "aggressive" were two descriptions of local computer users who attended last week's Middle Atlantic Computer Users' Forum and Exposition, at the Americana Hotel here.

Speakers and panelists commented that most of the users have begun to recognize the value of at least investigating the multi-vendor approach to obtaining equipment, services, education and training.

Shortly after the data communications keynote speech, over six users approached Dr. Dixon Doll to request information on technical training. Doll later commented that many users in the audience were well-acquainted with the technical aspects of data communications, but the desire for continued education is surprisingly high.

Conference attendance by Wednesday evening approached the three-day total for Boston of 2,200, including about 300 exhibitor personnel. It was estimated that the New York total would be about 3,000.

The show visits Washington, D.C., this week, and Atlanta next week, where hotel accommodations are already fully booked, according to H.G. Asmus, conference general manager. Asmus said the Regency

Hyatt House had set aside 150 rooms for vendors and another 150 for users and all those rooms were booked last week, more than 10 days prior to the Atlanta meeting.

### Desire to Innovate

On opening day, keynote speaker Lawrence Feidelman observed that the users of the newer data entry techniques had detailed, well-thought questions for the panelists, indicating a desire to innovate. "New York computer users are extremely aggressive," he noted, complimenting his audience's familiarity with key-punch replacement equipment, as well as OCR and direct data entry techniques.

(One panelist was called away on a business emergency, and his backup for the "intelligent terminal" workshop had to cancel his participation because of a death in the family. John Doonan, the direct data entry panelist, had evaluated some intelligent terminal equipment and applications, and covered that topic and direct data entry for his session).

The New York users caused one innovation within the format of the three-day meeting; when workshop sessions were too brief to answer all their questions, the workshops often reconvened on an informal basis after lunch.

Many users took this opportunity to have that "one last question answered," observed forum coordinator Edward Bride. Others made use of this ability to attend more than one workshop.

Frank Domingo, DP director at Blue Cross/Blue Shield of Greater New York, said it might sound like a "standard textbook statement" that other users have made, but "we hope and feel we are very close" to simplifying on-line systems.

The Blue Cross communications applications include customer files for five million records; an inquiry response system operates via 45 CRT displays and seven remote locations in Manhattan and Garden City, Long Island.

### 'Minimum Training'

The "simplicity" is achieved by using "minimum training" in the use of the CRT units, displaying data "in the format the user is accustomed to reading," not overloading the display with "more data than the user needs," and avoiding the need for external charts in the use of



New York panelist Donna Helledy expands on independent data communications equipment at the close of her workshop.

CRT units, Domingo related.

Domingo is the immediate past president of the Honeywell Users Group, and is accustomed to participating in open meetings of this nature, although they aren't always comprised 100% of end users. He said panelists, as well as the audience, benefited from participation in such a forum.

"Whenever we meet and discuss problems, we users benefit," he stated.

Lloyd Hamilton, vice-president of American Express Travelers Cheque Division, said he had "great admiration and envy" of users with more advanced data capture systems. "Our sales documents and methods of sale have not kept pace with advancing data capture technology," he acknowledged.

Four out of eight data entry firms could not meet American Express' editing tasks because of limitations in the minicomputers.

The system now used, made by General Computer Systems, Inc. of Dallas, has a mini with a range of 12K to 32K, he noted, with his application using 28K.

Hamilton agreed his personnel worked very closely with the vendor in custom designing the software, and, as a result, he has been able to "eliminate all key verification" in the data capture of sales information.

John Doonan, of Hankins Container Division of Flintkote Co., noted his direct data entry operators were clerks, and not ex-keypunchers, thereby reducing the retraining problem.

In the OCR session, Joe Vallorosi of Consolidated Edison discovered that users were more technically aware of OCR techniques, but still do not trust this area of technology.

In a communications session oriented toward the more conservative approach of "main-frame makers and common carriers" as equipment suppliers,

the attendees concluded that the conservative approach might not be suitable for all users.

Mrs. Donna Helledy, formerly with Manufacturers Hanover Trust and currently an independent consultant, discussed both sides of the "supplier" issue with about 50 active attendees, the largest single workshop on Wednesday.

Users are "not so loyal to IBM that they ignore the cost/performance" benefits of independent suppliers, she observed.

Dick Courtney, of Sperry & Hutchinson, spoke of the advantages of independent peripherals of all types. While he still has some IBM equipment, there are many vendors at the S&H center. Courtney predicted a new 2701 front-end processor from IBM in a matter of days (see page 1), although other users favored using minicomputers as 270 replacements.

Users of both dial-up and leased line data transmission methods expressed concern over reliability of remote data and accessibility of dial lines. Jim Mannino, of American Express Travel Division, noted data transmission across Manhattan can be more difficult than across the country, especially on a dial basis during heavy usage of business telephone lines.

On the third day, Charles P. Lecht continued his push for throughput studies and a better understanding of internal management techniques by calling on IBM to open its data centers for "all of us to learn."

Lecht actually implied this might be an impossibility, "since I suspect IBM's data centers lag behind many users' in management techniques" and innovations.

Lecht, an ex-IBMer, said it was time for the "Wizard of Oz to show" how internal automation can be accomplished. In order to know the status of their efficiency, however, Lecht told the



Western Union Data Services exhibits for the first time its EDT 300 printer terminal on the caravan floor.

users "you've got to know what's normal."

Inability to predict throughput remains a problem, he continued, conceding there are many tools available to measure system performance after the fact.

The people involved in data processing, as well as the machines, became topics during the "operational efficiency" sessions. Hal Aaron, of the New York Institute of Technology, said the users of the institute's data processing center began to feel more important when the center dedicated a "portion of the system" to their applications.

This ability came from the addition of large core storage, making modules of OS resident and further improving throughput, he stated.

The "finger-pointing" issue between (or among) vendors in a multi-vendor installation is still a reality, though many Boston users said this phenomenon had largely disappeared.

Aaron said a hardware problem was solved at his installation only when he "locked the two CEs in a room," and told them, "we don't care who is at fault. Solve the problem."

Another panelist also addressed the "people issue," noting "one of our most important independent peripherals is people." John T. Leslie, of American Airlines, said it is not sufficient to choose cheaper equipment, but the "use of that equipment" and the service available from manufacturers is a major consideration.

The quality of support from independent vendors is improving, Leslie commented, adding their sophistication is approaching that of "the major manufacturer."

The independent peripheral and system software workshops were the highest-attended in New York, as occurred in Boston. Derek Booth, of U.S. Trust Co. of New York, discussed the use of utility routines and other software tools to measure and improve operating efficiency.

Jerry Fraenkel, director of data processing at the Associated Press, has become an advocate of minicomputers, even though half his 26-year data processing career has been spent working with larger systems.

Fraenkel agreed with keynote speaker Lecht, who opined that minicomputers will continue to grow in sophistication and usage. As for large system users, the AP representative predicted that IBM 3330 disk drives would be adaptable for 360 usage in another year.

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Partial view of the exhibit floor.





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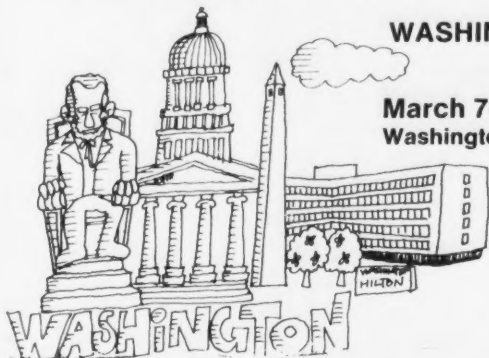


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SACRAMENTO, Calif. — A bill designed to curb the current annual theft of \$20 million worth of bicycles in California with the aid of the state Department of Justice's anticrime information computer has been introduced into the Senate.

The bill would establish a statewide bike licensing system and bicycle serial numbers would be fed into the computer with easy access to local police.

When a bicycle is reported stolen, the number would be distributed statewide immediately, a method currently used to recover stolen automobiles.

More than 400,000 bicycles were stolen in the state last year according to the bill's author, Senate President Pro Tem James R. Mills (D-San Diego).



## Recycled Report

Ford Motor Co. employee displays punched cards which will be recycled for use in the company's 1971 annual report to stockholders. More than 60,000 pounds of waste punched cards have been collected from Ford's computer operations for the recycling project.

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## R&D Contracts Get a Watchdog

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Aeronautical Systems Division's "watchdog computer" provides continuous status information on all research and development (R&D) procurements to "remind" contract monitors of potential delays and problems.

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Everything handled by ASD's R&D Procurement Division — purchase requests, military interdepartmental purchase requests, solicitations, contracts, contract modifications — is input into the computer, so almost any conceivable acquisition management inquiry can be made with the Lamis data base.

### Generates Reports

Lamis generates 10 "as required" alerts, 12 weekly reports, 20 monthly reports and seven quarterly reports, as well as special data audit reports. These are in addition to special reports generated by Lamis when there is a need for special action by the contract monitor.

When necessary — for priority information needs of higher headquarters or congressional inquiries — Lamis has instant retrieval.

Capt. Christopher J. Conley, developer of the system, explained that Lamis follows the "management by exception" philosophy. An information display is generated every time a corrective management action is needed.

Lamis operates on ASD's CDC 6600 using keypunched transcripts as the data transmission medium. Within a few months, Lamis will be tied to a Recognition Equipment Inc. optical character reader to enable direct input from source procurement documents.

Program offices and laboratories can hook up their computerized management systems to Lamis to "reduce their manual data input requirements ten-fold," Conley said.

The system will soon provide a direct interface with AFSC's management and scientific information system for all Wright-Patterson AFB laboratories.



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## Special Report

### Part II

### Storage and Internal Processing

*"The user can pick up 10 to 15% improvement in tape sorts versus disk sorts. And 25 to 30% improvement is possible on larger jobs."*

# Mag Tape Is Tough to Beat For Storage and Mobility

*"When a user wants to run a job on his computer but print it someplace else... tape has the needed mobility for transfer to another CPU."*

## Reading Backwards Tape Sort Feature Suited to CPU Jobs

By Ronald A. Frank  
Of the CW Staff

Magnetic tape may not be a glamorous new storage medium but it is alive and well at many user sites. Although in some cases tape is being upstaged by disk systems, many applications still rely on the tape peripherals.

There's no doubt that users are doing a lot of tape sorting, according to Vince Jones, manager of product marketing for Potter Instrument Co. "And a lot of users are bringing their input in with key-to-tape or card-to-tape systems," Jones says, "for entry into active files."

*"One definite trend of the future will be increased efficiency in operator handling."*

"There's still a tremendous amount of serially accessed data in this business," Jones says. "And this type of user is processing with tape every day, every month and every quarter," he adds.

### Mobility Important

Among the more important characteristics of tape operations is tape mobility. This is especially important to users who regularly transfer large amounts of data from one location to another. One bank officer says his institution will soon test the exchange of tapes as a possible substitute for shipping cancelled checks from bank to bank.

While such applications may be a bit futuristic, tape is already important in banking circles for another reason. "Tape is recognized as an official medium for an audit trail," according to one financial user. "Disk has not yet attained that status," he adds.

"We've got to have well-documented backup procedures," Richard O'Sullivan, DP manager of the U.S. Trust Co., says. All of the bank's important records are stored at a special repository in upstate New York, O'Sullivan notes, and all those records are on tape.

Magnetic tape costs about \$.001 cent/bit, according to Tom McCrystal, tape specialist at Pertec Corp., while disk costs

about \$.02 cent/bit. This is one of the reasons why tape lends itself to archival usage more than disk.

The storage attributes of tape are also significant. In any given space, more data can be stored on tape than on disk, and at less cost, according to Mike Murphy, director of sales for Telex.

"It's easier to destroy data on disk than it is on tape," Murphy says. "There are ways of fixing a tape so that one can't destroy the information on it," Murphy says. There's a no-write ring on each tape reel which can be removed to preserve the data. When this ring is removed from a reel used for a master file, there's no way that a tape transport can write on that tape," he states.

### Unusual Feature

Tape systems can also be used on what are often classified as software jobs.

These utilities, as designated by software specialists, can run better on tape in certain circumstances.

"Any sort jobs on the 360s or other CPUs lend themselves to reading backwards. And with this capability, tape sorts can often surpass disk sorts," according to Larry Martin, branch manager for Software Design Inc.

"The user can pick up 10 to 15% improvement in tape sorts versus disk sorts," Martin says. "And 25 to 30% improvement is possible on larger jobs," he adds.

Being able to read backwards and not

### Regular Cleaning, Testing

## Performance May Depend on Tape Maintenance

As higher-speed tape drives like the IBM 3420 and their independent equivalents are widely used, users are becoming more aware of tape quality and maintenance.

Some tape suppliers insist premium quality tape is the only way to go. Others say conventional "bread-and-butter" Mylar tape is fine for any job.

One company that has stressed the user benefits of premium tape is Graham Magnetics. "Users spend considerable sums of money for the latest in high-speed tape drives and then they scrimp on the tapes that are run on those units," according to Robert C. Foley, vice-president of Graham. "It's like buying a \$20,000 Maserati and then using 18 cent/gallon gas to run it," he adds.

Higher-speed tape drives operate at 250 in./sec forward and up to 690 in./sec in rewind, Foley says. "And the conventional tape coatings of today are produced in environments designed to withstand 90 in./sec."

### User Gets Performance

"The user will pay 25% more for premium tape," Foley says, "and for his extra money the user gets performance." Because of the lack of sophistication in

having to rewind tape to go through sequential passes every time works out fine for sort jobs, Martin says. The newer tape drives can read in reverse order and when the input is done, they can merge backwards. The drives go forward and

out to tape, Kurt says. On weekends or other off hours, the "tape can be run back through," he states.

Another instance where tape usage is indicated is a job with a master/slave CPU relationship. "When a user wants to run a



Users of independent tape drives such as the Ampex TM-16s can usually save over comparable IBM units.

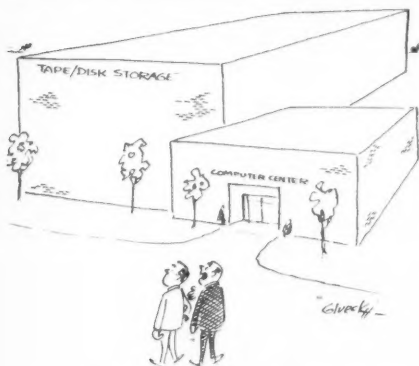
backward on the work tapes, until the proper sequences are established for merging into a final pass. The user can pick up quite a bit of time with this sort method on a fast tape drive, he adds.

A spooling system that can use tape as well as disk has some obvious advantages, according to Ken Kurt, vice-president of Software Design Inc. Tape lends itself to a big job where printing has to be done on an irregular basis that can't be scheduled into normal work runs. Instead of printing such jobs, the user can flush it

job on his computer but print it someplace else," tape has the needed mobility for transfer to another CPU, Kurt believes.

One disadvantage of tape operation is the manual setup time required for an operator to mount and dismount the tape reel. But many users feel they can schedule their jobs so that operators can pre-mount tapes. In such cases the tape is ready to roll when the sort comes into operation.

(Continued on Page 9)



"... And we're even thinking of expanding that shortly."

# Independent Drives May Affect IBM Diagnostics

## • IBM's Diagnostics Policy Not Clearly Defined

## • User Keeps IBM Tape Subsystem for Backup

## • Independent Can Offer Similar Diagnostics

When a tape user chooses independently supplied drives, he may affect the diagnostic packages which IBM includes as part of OS and DOS, according to one user.

These diagnostics include the On-line Test Executive Program (Oltep), introduced about six months ago by IBM. Oltep is designed to assist the CE and/or the user in exercising the tape controller and drives to isolate specific operating problems. Officially IBM encourages the use of the program only for its own maintenance personnel but sophisticated users can learn to handle it, according to one system efficiency expert.

When independent tape drives are brought in, the Oltep diagnostics can be used to exercise independent tape controllers and drives if the non-IBM units are plug-to-plug replacements. But IBM's policy on diagnostics is not clear. One user says IBM withdrew its diagnostics when he went to independent equipment.

But another user maintains he has

had independent tapes since late last year and IBM has not withdrawn the Oltep program.

One user feels he has a unique solution to the problem. "We went to independent tape units but kept one IBM tape subsystem around for backup," he says.

At least one independent supplier is prepared to offer users comparable diagnostics if IBM decides to withdraw Oltep. "We can supply the user with comparable diagnostics to those which IBM supplies, whenever this is necessary," according to Wayne Bren of Storage Technology Corp.

For users of Storage Technology's 3420 replacements, STC can supply an in-line diagnostics package called Subsystem Program for Analysis and Repair (Spar). The advantage of Spar is that it can provide in-line diagnostics which don't tie up the CPU, Bren states.

"Our controller has a random access memory which we can program from a tape cassette. With this capability we

can provide necessary diagnostics to users of 3420 equivalent systems," according to Bob Mosch, product manager for end-user tape with Ampex.

Even if IBM withdraws its diagnostics, most independents will be able to provide an alternative capability, is how one industry source put it.

Officially IBM says it will not withdraw any diagnostics from a user's operating system when he decides to go independent. "But if a customer invokes Oltep or its associated On-Line Test (OLTs), several things may happen. It may work, it may appear to work while actually printing diagnostic listings that may be meaningless, or it may not work at all," an IBM spokesman states.

IBM will not withdraw the diagnostics unless it provides systems generation support for a new release, at which time it would install only those diagnostics needed for IBM peripherals that were part of the user's configuration, the IBM spokesman adds.

## Mobility, Easy Storage Tape Attractions

(Continued from Page 8)

"One definite trend of the future for tape drives will be increased efficiency in operator handling," according to Tom McCrystal of Pertec Corp. Self-threading and automatic loading features will eliminate the relatively slow process now required for loading tapes, he says.

### For Slower Drives

While automatic threading has been available on tape drives from suppliers such as Honeywell,

Ampex and IBM for some time, McCrystal sees the feature also being applied to more economical, slower drives up to 75 in./sec.

Although any tapes generated on Pertec drives can be read on most models of IBM tape systems, McCrystal notes some unique features with Pertec systems. "We provide users with 7-in., 8-1/2 in. and 10-1/2 in. reels," he says. "Called the mini, midi and maxi line, the varying sizes give users the capability of using smaller reels for smaller jobs," he adds.

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## Editorial

### Government by Computer

The Federal Reserve Board mystified economists recently when it bought a large number of government securities and then reversed its decision a day later and sold a large number.

It later blamed its bewildering actions on false output from its computer.

The case is frightening for three reasons: the reliance on computer output, the ease with which officials blamed the computer, and the cloak of secrecy wrapped around the incident.

First, the Fed obviously believed the data coming from the computer was correct, when it was not.

Second, the Fed was quick to put all the onus for its puzzling actions on the computer, when the error was more than likely caused by a human mistake somewhere along the line.

Third, the Fed has steadfastly refused to release any more information to the public. It will not even say whether the error was caused by the machine or by the people using it.

At a time when government officials are more and more basing their decisions on data pumped out by computers, it seems appropriate to ask whether the Fed's actions represent computer-assisted government or government by computer.

We hope the President and Congress take note of this incident and make sure a precedent hasn't been set whereby major government blunders are passed off as "computer errors" and then hushed up.

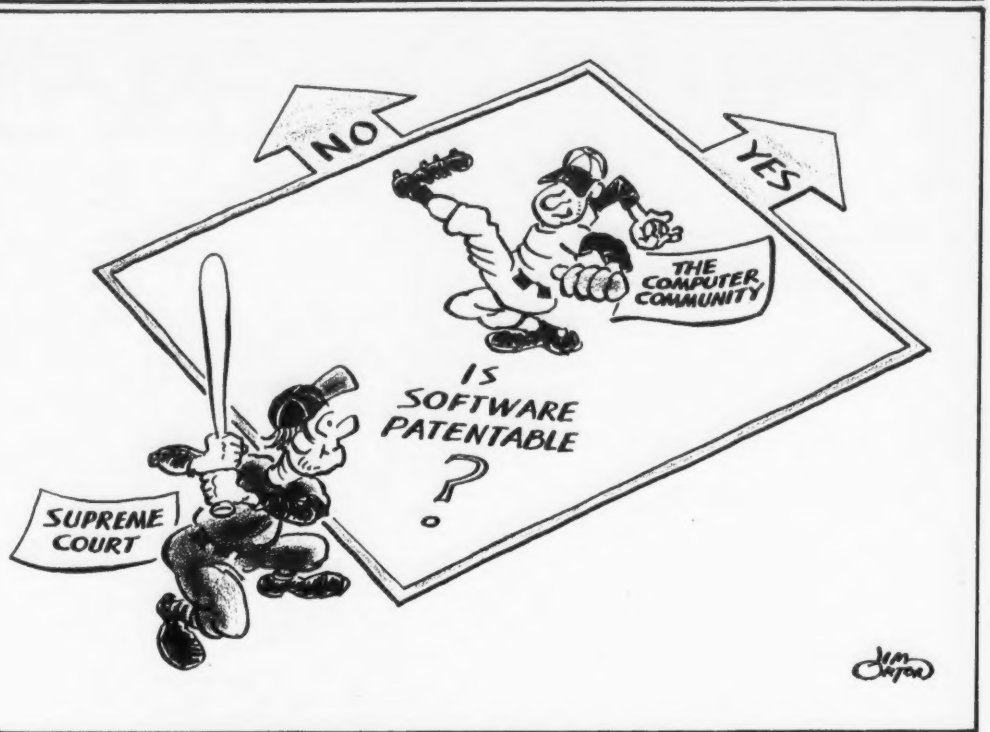
### Who Gets Overtime?

The U.S. Labor Department's ruling that DP personnel are not professionals and therefore not exempt from the wage and hour laws [CW, Feb. 16] apparently has been taken too literally by many employees.

What the department said was that DP personnel were not automatically exempt under the "learned professionals" section.

However, they may be exempt under the sections covering "administrative or executive employees" and employees who "exercise discretion and independent judgment" in handling their responsibilities.

The department did, however, single out the following employees as failing to meet the "discretion and independent judgment" criteria: tape librarians, keypunch operators, computer operators, junior programmers and programmer trainees.



## Letters to the Editor

### X,Y Theory Schools Owe McGregor Debt

Regarding Henry Marcus's letter and Mike Ingram's reply [CW, Feb. 23], I think it's important to point out that the Theory X and Theory Y schools of management are the two basic suppositions underlying the motivational theories of Professor Douglas McGregor of the MIT School of Industrial Management. McGregor describes them in great detail in his book, *The Human Side of Enterprise*, New York, McGraw-Hill, 1960.

I think it is important that McGregor be given the recognition he deserves. In addition, I think it is important that Marcus and his colleagues be made aware of this very important work if they wish to learn more about current theories on motivating people.

There has been a great deal written by people who agree and disagree with McGregor. I don't have access to specific references but I believe there were articles of this nature in the 1970 *Harvard Business Review*. In fact, I'd direct anyone interested in this area to the Harvard Business Review Reprint Volume entitled *Motivation*.

Stephen Auerbach  
Norwalk, Conn.

### An Ordinary Magnet Will Do Just Fine

I and many others like myself have long realized the credibility gap regarding the dangers of magnets to magnetic file storage.

Frank Piasta has helped narrow this gap with his article [CW, Feb. 16]. I'm afraid that W.D. Tiffany of SRI, who contributed most of the information, has understated the possible dangers.

The second to last paragraph in the article states: "There are certain special-purpose magnets that could be used, . . . but they would have to touch the tape to have any real effect." The magnet may have to touch the tape, but I seriously question the necessity of a "special-purpose" magnet.

I guarantee you can destroy, or

at least make unreadable, information on a tape with a magnet as weak as a magnetized screwdriver. I have done it, the first time by accident, thereafter to prove a point to others who doubted me. I have never failed to duplicate the condition. I hardly call a magnetized screwdriver, which most servicemen carry, a "special-purpose" magnet.

Jack R. Hines  
Arlington Heights, Ill.

### '100% Uptime Not 100% Efficiency'

Concerning your article "100% Efficiency Will Satisfy Dartmouth T/S" [CW, Feb. 9], 100% uptime does not infer 100% efficiency. Uptime is a measurement of availability of the computer system, or systems; efficiency is a subjective relationship of useful work delivered by a system versus the energy and resources applied to it.

A computer system can have uptime of 100% with an efficiency of 1 to 100%; for example, if a computer system is up and only executing Operating Systems functions, then the amount of useful work, from a user point of view, would be minimal.

Your choice of words, or terminology, is incorrect in describing the uptime - availability - of the Dartmouth Time Sharing System (DTSS).

Ralph J. Ross  
Wayne, Mich.

### Arab Press Uses Monotype, Linotype

Re Arab typesetting [CW, Feb. 9].

Arabic can be set both by linotype and monotype and is done so both in London and the Near East.

I don't know anything about the linotype system - it apparently makes use of the side cases for the less frequently used characters - but the monotype keyboard is large enough to hold the 280 normally used characters.

Arab newspapers use monotype or linotype for body type and have calligraphers draw the

headlines. Printing is by offset.  
Joseph Hanlon

London, England

### SS Numbers Called Good Identifiers

I am responding to your comment pertaining to use of Social Security numbers for identification [CW, Feb. 23].

Why not use Social Security numbers for identification? We are identified by a number in almost all business transactions. Example: bank accounts, loans, credit unions. Better yet, the larger churches now identify their members by a number, and for what purpose? Reporting to IRS.

SCC operates a service bureau that is dedicated primarily to insurance companies and credit unions. It would solve a lot of problems if all our customers used Social Security numbers for member identification.

I am looking forward to the day when I can be identified as 446-32-3985, as well as Milton Brandon Jr.

Milton Brandon Jr.  
Vice-President/General Manager  
Statistical Computing Center  
Oklahoma City, Okla.

### Uncommon Standard

Regarding your opposition to using Social Security numbers as a standard identifier of individuals [CW, Feb. 23] - asinine. I can think of no more common denominator.

Your opposition is typical of many people in our so-called "profession" who want all the goodies and perquisites of office without any of the responsibilities, disciplines or constrictions of organization.

I'm also certain you'll publish in bold type an answer below this letter (if you publish this letter) which will be snide, smug and caustic.

Frank A. Mleko  
Arlington Heights, Ill.

*Computerworld* welcomes comments from its readers. Letters should be addressed to: Editor, *Computerworld*, 797 Washington St., Newton, Mass. 02160.

## Impracticality of Maintenance Issue

# Possible Letter to IBM Could Be Part of User's Plans

Many computer users are wondering whether they will receive a letter from their IBM branch manager on March 3 announcing withdrawal of maintenance from their processors. The following letter, to a hypothetical IBM branch manager, might form part of the user's advance planning. It is based upon the letters IBM branch managers have recently sent to customers in similar situations.

Dear John,

I have received your letter of Friday saying you intend to withdraw from our maintenance agreement on the 2030 machine. You claim this is a proper action on your part because somehow or other we have broken our agreement — but you do not cite any particular phrase or clause in the agreement. You do, however, indicate that it is related to the additional memory.

You complain that this memory has additions so extensive that the machine is now a hybrid. However, if you will refer to the Multiple Suppliers Systems Bulletin, which you brought to me when we were deciding to install the additional memory, you will not find anything at all wrong with the additions, or alterations, being extensive, or creating a hybrid. I must, therefore, reject any reasoning based on the extensiveness of the additions or alterations.

### Partial Maintenance Promised

You also claim that maintenance of the 2030 machine is impractical. However, we have not asked you to maintain the machine and, indeed, again referring to your own policy statement, the Multiple Suppliers Systems Bulletin, you will notice you only promised to continue to maintain the unaltered parts of the machine. Presumably, if the alterations are so extensive this may mean only a small part of the machine can be maintained, but providing you do not charge us too much we would welcome IBM maintaining even a small part.

For instance, we do not object at all to your man coming in and entering the hazardous area where the filters are. (It is perhaps a little bit of poor design not to have organized the filter system so that the filters can be changed from a safe zone.)

As you have not defined which parts of the machine you now find it impractical to maintain, I have had a set of standard diagnostics run and find they do run without problems. I have looked at the wiring, and I find your unaltered wires are still available. I have looked at the unaltered SLT cards, and I find they are still available. I have looked at the ROS cards, and I find the unaltered ROS cards are avail-

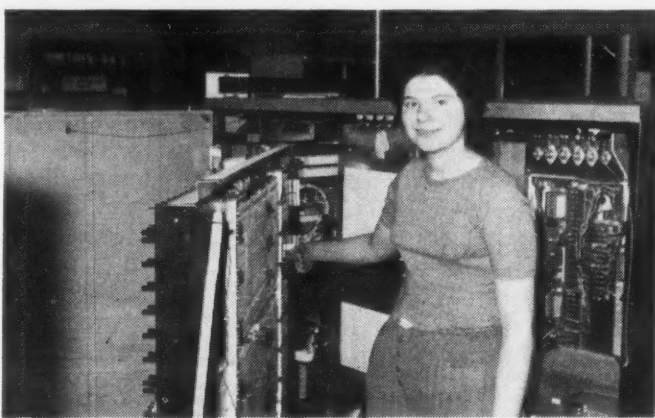
able to you.

Moreover, even where the SLT cards and the ROS cards have been altered I find that circuits identical with your own have been installed, and that program words identical with those you supply have been retained.

My supplier tells me it was quite practical for you to have insured this circuitry was actually your own — if you had been prepared to let him buy your on-the-shelf items. Even now, in order to help maintain the machine, we will start using your circuits when you make them available to us.

### One Problem

We did find one possible prob-



The 12-year-old girl is disconnecting the alterations that prevented some of the diagnostics from running on an extended Model 30. When told that IBM considered it impractical for its trained men to perform such tasks so as to be able to run the diagnostics, she asked, "If a 12-year-old can do it, why can't a trained man?"

lem in running the IBM-supplied on-site diagnostics. Test 29 "failed" because naturally a 128K system had better not wrap its addresses at 64K. I don't see what any system is doing wrapping at 64K when the Principles of Operation Manual says wrapping is at the 8 million level.

So I asked whether we could make the machine handle the problem. We found out that we could — and there is a switch which your men can easily use to make it look like a 64K system for this diagnostic.

My 12-year-old daughter operated it for me (see photo). Her question, and I think it's a good one, was "If I can do it, how can it be impractical for trained men?"

Under these circumstances, I cannot see how it can be "impractical" for you to continue to maintain the unaltered part of your 2030, and I note that you have provided absolutely no evidence that it is so. I therefore must regard your unilateral actions as discriminating against me — and I object to that.

### Planning Ahead

However, you apparently intend to go ahead and withdraw maintenance on the 2030, and we must therefore plan for this. You say you will continue to maintain the other IBM-manufacturer equipment. I trust you will insure that this maintenance is performed properly, and that neither our expenses, nor our standard of performance, will be hurt in the future. We need our

tapes and our disk drives.

It is my understanding that to maintain this equipment your corporation (unlike Ampex Corp., Storage Technology, Information Storage Systems) requires use of a central processor as a diagnostic tool.

For you to perform maintenance properly, therefore, I am having a corner of the computer room cleared so that one can be installed for the use of your engineers — I hardly think they will want to bring the processor in each time they come here on a call!

I would offer to rent you time on our processor (\$150/hr), but see that this might not be adequate as you would have no real

necessary to have one of our processors, and that you are prepared to supply it. I was afraid for a moment we would suddenly find out we had to get one of your approved processors — just so that we could have maintenance from you on our tape drives!

### Personal Responsibility

I am also pleased to see the way you personally back up your corporation. The way you really trust your engineers, for instance. I think your faith in their judgment is something that a lot of other corporation executives might not have in your place. Personally signing a letter (and so taking quite a lot of personal responsibility) telling us it is "impractical" to continue maintenance of our equipment, without your ever having personally inspected the alterations, or having asked us whether or not we might know how to maintain it (after all, it is our equipment, and we do happen to know something about it), just on the say-so of some engineers, shows real faith!

Did you know the engineers only inspected the hardware, but did not try out maintenance procedures practically? And that we have had months of no-incident maintenance since the alterations were made?

We reserve our position on this undocumented claim of impracticality of maintenance until you show which altered part is interfering with the maintenance of which unaltered part so seriously that it is not practical for IBM to continue maintenance. (I am planning, when you do identify such a case, to alter the previously unaltered part — so taking it out of your area of concern, and demand that you continue maintenance on the remaining unaltered parts — so don't start re-allocating your maintenance force just yet.) We are preparing to provide, at cost, facilities that you need to maintain the remaining equipment, and I look forward to hearing when you will be ready to do so.

Your customer,  
Jim

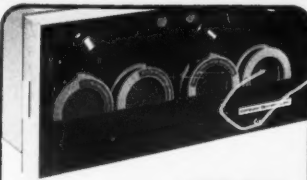
P.S. Shouldn't we be receiving a credit on our maintenance charges as you have not been maintaining the full 2030 since the alterations took place? You have been paid for full maintenance, which seems unreasonable. As you say, the alterations are extensive; how about compromising by returning 50% of the maintenance charges to date? It will be cheaper than turning it over to the legal area — don't you think?

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### The Taylor Report

By

Alan Taylor, CDP



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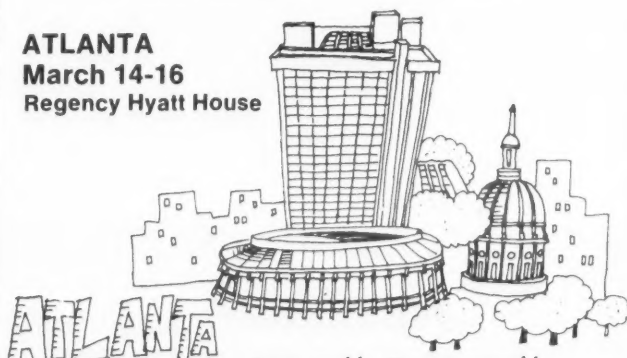
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☐ Tapes \_\_\_\_\_ Quantity \_\_\_\_\_ Feature # \_\_\_\_\_

Quantity \_\_\_\_\_ Feature # \_\_\_\_\_

☐ Printer \_\_\_\_\_ Quantity \_\_\_\_\_ Feature # \_\_\_\_\_

☐ Card Reader/Punch \_\_\_\_\_ Quantity \_\_\_\_\_ Feature # \_\_\_\_\_

☐ Other: \_\_\_\_\_

☐ I plan to dispose of the equipment in the following way: \_\_\_\_\_

Approximately when? \_\_\_\_\_

At the following price range \_\_\_\_\_

☐ I'm looking to acquire the following equipment: \_\_\_\_\_

Approximately when? \_\_\_\_\_

☐ I am considering buying \_\_\_\_\_ leasing \_\_\_\_\_ other \_\_\_\_\_

☐ I plan to use this machine for \_\_\_\_\_ years

☐ Lease terms I have in mind are: \_\_\_\_\_

Years \_\_\_\_\_

☐ Price range \_\_\_\_\_ % Mfg. Price \_\_\_\_\_ % Mfg. Rental

☐ I'm changing equipment for the following reasons: \_\_\_\_\_

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**The Professional's Viewpoint****Non-Multiple Choice Examination for DPer's?**

Dr. Melvin D. Field, of Cambridge, Mass., is one of the CDP holders who feels the CDP is not as strong as it should be. Like many others he responded to the SCDP Survey of Professional Opinion on the CDP Examination, and agreed with the majority who called for keeping the examination up-to-date [CW, March 1].

Perhaps because of his own background he went one step further, by stating "multiple-choice questions are not adequate."

This shed new light on the

"The Professional's Viewpoint" is prepared by the Society of Certified Data Processors in conjunction with the editors of *Computerworld*.

matter, because if multiple-choice questions are not adequate then either we should drop the examination or use non-multiple choice questions. And if non-multiple choice questions are used then perhaps some of the problems which have been noted about the examination could be solved.

It is an interesting idea, so SCDP, while currently having no opinion about the solution, worked out a possible non-multiple-choice style examination as a potential alternative.

**Worth Following Up?**

After reviewing the situation, it appeared quite likely that in fact a number of these problems could be solved by this new approach. Now we would like to know what you think of such an examination, and whether you think it is worth following up.

To express your opinion,

please read the brief description of the possible examination, its apparent advantages and disadvantages and complete the questionnaire.

**Non-Multiple Choice**

**Examination Format** — Six papers, spread over two days. General technical papers (hardware, software, applications) on the first day, and specialized papers (professional rules, state-of-the-art, specialized subjects) on the second day.

Papers would normally include a few compulsory and several optional questions from which the candidate would choose. Normally, but not always, the questions would allow the candidate to define his own specific environment.

This ability to use different environments could be the greatest benefit of a non-multiple-choice type of exam. With multiple choice, where the answer has to be defined in advance, the problem of providing equal chance in the examination to users working in very common situations (such as a U.S. IBM-hardware, Cobol business shop) or for much less common ones (such as Canadian, Burroughs scientific users have) has been insuperable, and has also restricted the depth of the questions.

When non-multiple-choice exams are used, each answer can be considered separately — and its correctness checked from reference books after the candidate has himself defined his environment.

**Specialization Catered For**

Specialization could be catered for by having specialist papers in

**Survey of Professional Opinion On Non-Multiple Choice DP Exam**

1. Assuming the benefits of a non-multiple-choice exam are real, would they make a qualification more or less valuable to you?

Characteristics	More Valuable	No Difference	Less Valuable
Different environments considered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specialized papers possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More frequent examinations possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Publication of papers possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Update exams in specialties easier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. The use of a non-multiple-choice examination appears to involve additional examination costs, both for grading and for site provision. By how much, if anything, would it be reasonable to increase the current examination fee (\$50), to cover these costs in view of your opinion of the possibly increased value of the qualification? ☐ Nothing ☐ \$10 ☐ \$20 ☐ \$30 ☐ \$40 ☐ \$50.

3. Do you feel that the investigation of alternative forms of examination, beyond the current multiple choice type, should be continued or dropped as perhaps detrimental to the CDP image, or as a waste of time?

- ☐ Continue it. ☐ Drop it — It's a waste of time.  
☐ Drop it — It may hurt the CDP image. ☐ Other

4. What other points would you want the Society of Certified Data Processors to consider?

(Continue any answers on separate page, if necessary)

Name \_\_\_\_\_

Address \_\_\_\_\_

CDP Holder? ☐ Yes ☐ No SCDP Member? ☐ Yes ☐ No

When completed, please mail to the SCDP, c/o the Professional Viewpoint Page, *Computerworld*, 797 Washington St., Newton, Mass., 02160.

communications, operational management, programming management or system auditing. Different experience requirements could be for different specialties. Specialist certificates as well as general certificates could be given, which were asked for more than once.

Keeping up with the state of the art would be possible by providing a "recent events" paper, which could be general, specialized or both.

As this could be taken whenever a candidate likes (having passed it one year does not give him any unfair advantage next year), it could provide one way of renewing one's qualification, instead of having it becoming steadily more obsolete.

One respondent, incidentally, suggested CDPers should be made to put an asterisk after their names four years after passing the examination — a la Roger Maris!

Publication of the questions would also be possible. The integrity of the next examination would not be hurt if it was known that last-time applicants were asked to explain how some application makes use of forecasting-type software (such as sales forecasting, project control, computer system simulation).

**Frequent Examinations**

Frequency of examination could be increased, because the dropping of multiple choice would also involve the introduction of hand-grading. This means that instead of wanting to bunch the processing at one time for the sake of efficiency, the grading would be handled a few exams at a time for the sake of smooth work loads.

On the other hand, it is probable that the cost of hand-grading could raise the cost of the examination itself. Frequency of exams could reduce the number of sites, or again raise the cost.

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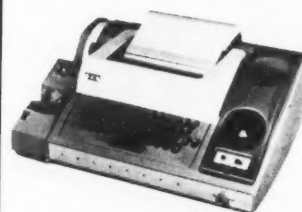
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# Britisher Views Trademark, Copyright As Best Software Program Protection

By Joseph Hanlon  
CW Correspondent

LONDON — Old-fashioned secrecy is a much better protection than a patent for computer software. If legal protection is really desired, copyright and trademark are best.

This is the advice of Dr. Bryan Niblett, a software authority who has also been a practicing lawyer.

"The best way to protect software is to follow the example of the Carthusian Monks and their Green Chartreuse — get a good trademark, charge a lot for it and keep it absolutely secret," Niblett declared.

The trademark must be registered with the government and put on all output from the software. Advertising is used to build goodwill in the mark and to identify it with the system. The trademark is an effective protection because even if someone gets an exact copy of the program, he cannot use the trademark associated with it, and thus is restricted from marketing the system in competition.

Trademark protection, Niblett said, would be particularly useful for a system with a recognizable output, such as flowcharts or bills.

Most important, trademarking does not require the owner to reveal the contents of the program. The owner should keep close control of the program, and only distribute it in binary object code to make it more difficult for someone to figure out how the program works, Niblett said.

## Automatic Copyright

Copyright may also be an effective means of protection, Niblett stated. "Every program that is written down automatically attracts copyright, without a copyright statement of formal registration — it's on-line generation of property right," he stated.

Once the program is "published," the copyright must be registered and each copy must contain the symbol "©" or the word "copyright," and the date of copyright, Niblett added. For software, "published" means that more than a few copies have been made or that it is offered to the public through a newspaper advertisement. Printing out an extra copy is not "publication."

Software copyright raises a few problems. The law must be twisted slightly: the software itself would be treated as a written work and the flowcharts as "artistic works." Copyright requires an author, so there is some question as to whether machine-written software is copyrightable.

Copyright protects the form, but not the substance, of a work, Niblett explained. Thus, copyright does not protect against someone taking the basic idea and writing his own program. But it does protect against direct copying, as well as against translations into other languages or codes.

Niblett suggested that programmers might insert complex, fast running, useless loops in the program for identification.

## Job Bank Stresses 'Capability'

SACRAMENTO, Calif. — Unemployed engineers and scientists from all parts of the nation can now register their job capabilities with a computer here. The National Registry for Engineers stores information on 15,000 unemployed engineers and scientists for instant reference by employers.

Although jobs are limited due to economic conditions, there has been a good response from employers, according to E.W. Gloer, registry manager, and "some people are going to work."

The registry, funded by the Department of Labor, lists job candidates according to their capabilities, rather than specific experience, since federal money is available for retraining.

Niblett dislikes patents for software because the author must reveal the basic idea in order to get a patent, which might permit someone else to use the idea without infringing. Furthermore, the process of patenting is long and expensive, and few programs are novel enough to qualify.

In England, there is another argument against patents. The Banks Committee on the Patents System, which reported 18 months ago, came out against software patents. The government has said that, in general, it supports the recommendations. So far, no legislation has been proposed, but Niblett expects the program patents will be prohibited within a few years. (So far, at least two programs have been patented in England.)

The Banks Committee opposed software patents on three grounds:

- Software patents would restrict the free use of computers.
- Infringement would be hard to detect.
- Patent searching would be difficult.

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Asynchronous (Spooling or Browsing) Tasks ..... Yes  
Message Switching Support ..... Yes  
Optional Logging of Any Operation ..... Yes  
Error Recovery from Application Failure ..... Yes  
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## Nasis Takes a Closer Look at Labor...

By E. Drake Lundell Jr.

Of the CW Staff

WASHINGTON, D.C. — Department of Labor regulations on computer-based job banks are "impairing the ability of the states to develop compatible information systems within the states at the lowest cost," according to the National Association of State Information Systems (Nasis).

The group charged that even though Labor Department regulations allow state employment bureaus to process "job bank" information on shared computer systems, many of the state agencies are ignoring this and establishing their own systems.

### 'Own Facilities'

Present Labor Department guidelines on the development of such job banks "have the tendency to encourage the state employment security agencies to ignore state policies and to retain their own computer facilities," Nasis charged in a letter to Secretary of Labor James D. Hodgson.

The organization has also charged that the FBI's requirement that all computers tied into the National Criminal History System leads to waste and duplication of computer facilities [CW, Jan. 12].

State or local employment agencies setting up dedicated computer systems for job bank applications prevent "states from coordinating and/or integrating the computer operations and facilities necessary to meet

Department of Labor requirements with those of other state requirements," the Nasis letter said.

Overall, Nasis said, the department's Bureau of Employment Security (BES) has taken "effective steps to speed the development of major information systems and their implementation throughout the states."

However, the tendency of state employment security agencies to establish dedicated systems is undermining this effort and in many cases it is done "at substantial and unnecessary expense to the taxpayer," Nasis said.

"As unfortunate as this approach is presently," the group said, "it will become increasingly

expensive and obstructive as we proceed further with implementation of integrated information systems in the states.

### Backup Expensive

"For example, the job bank will ultimately be a full on-line telecommunication system, both inter- and intra-state. Such systems invariably require backup. That backup can be quite expensive when used only for one system.

"Further, the communication line requirements are oftentimes more expensive than the computer — when dedicated to a particular purpose as is most often the case when systems are dedicated," the group said.

## ...Women in Labor Get Close Look

BIRMINGHAM, Ala. — A \$154,871 grant for research on computer monitoring of pregnant women in labor has been awarded to the University of Alabama by the John A. Hartford Foundation, Inc., of New York.

Motivation for the research arose because the progress of hospital labor room patients is usually followed only intermittently by hospital personnel. These intermittent observations provide acceptable, if marginal, obstetric care in normal labor, but they become unacceptable in high-risk pregnancies. During these conditions, rapid deterioration of the fetus can occur before a diagnosis is made, according to Dr. Charles Flowers, chair-

man of the university's School of Medicine's Department of Obstetrics and Gynecology.

"Since alterations in the status of the fetus can occur rapidly, constant observations must be made," he said. "The logical solution to the potentially dangerous situation was the development of a computer that will monitor automatically and constantly such things as uterine activity and fetal heart rate.

"The computer will sound an alarm if any abnormalities develop. Following the occurrence of an actual or potential fetal problem, the computer will print the diagnosis so that the labor room personnel may inform the physician and take appropriate actions," Flowers noted.

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OPERATING SYSTEM MONITOR FOR PERIOD 21.07.54.75 72.031 THRU 1.31.51.70 72.032									
REPORT OF SVC USAGE									
*** BY SVC NUMBER ***					*** BY USE COUNT ***				
SVC	TIMES USED	FUNCTION	TYPE	SVC	TIMES USED	FUNCTION	TYPE	SVC	TIMES USED
SVC000	508648	EXCP	1	SVC000	508648	EXCP	1	SVC000	508648
SVC001	273301	WAIT	1	SVC001	273301	WAIT	1	SVC001	273301
SVC002	26334	POST	1	SVC002	26334	POST	1	SVC002	26334
SVC003	98403	EXIT	2	SVC003	98403	EXIT	2	SVC003	98403
SVC004	39883	GETMAIN	1	SVC004	39883	GETMAIN	1	SVC004	39883
SVC006	21	EDGETAIN	1	SVC007	26916	STIMER	2	SVC007	26916

OPERATING SYSTEM MONITOR FOR PERIOD 21.07.54.75 72.031 THRU 1.31.51.70 72.032									
REPORT OF MODULE USAGE									
MODULE NAME	USE COUNT	PERCENT OF USE	CUMULATIVE PERCENT	SIZE	MOD. FUNCTION	SIZE	MOD. FUNCTION	SIZE	MOD. FUNCTION
IGG01001	414	2.20	2.20	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION
IGG01006	414	2.20	4.40	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION
IGG01009	414	2.20	6.60	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION
IGG01008	414	2.20	8.80	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION
IGG01005	414	2.20	11.00	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION
IGG02002	407	2.21	13.21	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION
IGG02007	407	2.21	15.42	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION	1024	OPEN MERGE AND ACCESS METHOD DETERMINATION

OPERATING SYSTEM MONITOR FOR PERIOD 21.07.54.75 72.031 THRU 1.31.51.70 72.032									
REPORT OF DEVICE UTILIZATION									
UNIT ADDRESS	EXCP COUNT	% CPU BUSY	% DEV BUSY	% DB SEEK	% DATA TRANS	% NOT READY	DEVICE CLASS	UNIT ADDRESS	EXCP COUNT
130	46232	4	15.5	0.2	13.8	0.0	DIRECT ACCESS	130	46232
131	9372	0	0	0	0	0	DIRECT ACCESS	131	9372
132	0	0	0	0	0	0	DIRECT ACCESS	132	0
133	0	0	0	0	0	0	DIRECT ACCESS	133	0
134	0	0	0	0	0	0	DIRECT ACCESS	134	0
135	0	0	0	0	0	0	DIRECT ACCESS	135	0
136	0	0	0	0	0	0	DIRECT ACCESS	136	0

OPERATING SYSTEM MONITOR FOR PERIOD 21.07.54.75 72.031 THRU 1.31.51.70 72.032									
DATA SET NAME									
UNIT ADDR	VOLUME SER NO	EXCP COUNT	START CC HH	END CC HH	% TOTAL EXCPS THIS CH	% TOTAL EXCPS THIS UNIT	UNIT ADDR	VOLUME SER NO	EXCP COUNT
SVS1.LINKLIN	23A	MT111	14333	52 0	87 19	7.78	17.41	SVS1.LINKLIN	23A
SVS1.SVCLIN	23A	MT111	20490	89 0	97 19	14.56	32.93	SVS1.SVCLIN	23A
SVS1.SVCLJORD	23A	MT111	20596	130 0	144 19	13.88	31.40	SVS1.SVCLJORD	23A

OPERATING SYSTEM MONITOR FOR PERIOD 21.07.54.75 72.031 THRU 1.31.51.70 72.032									
REPORT OF CHANNEL UTILIZATION									
CHANNEL NUMBER	NUMBER OF CHANNEL REQ	NUMBER OF TIMES BUSY	PERCENT OF TIME BUSY	CHANNEL NUMBER	NUMBER OF CHANNEL REQ	NUMBER OF TIMES BUSY	PERCENT OF TIME BUSY	CHANNEL NUMBER	NUMBER OF CHANNEL REQ
0	23767	12	.0	0	23767	12	.0	0	23767
1	153631	52895	34.4	1	153631	52895	34.4	1	153631
2	205898	64908	31.5	2	205898	64908	31.5	2	205898

## Random Notes

**AL/COM Adds Ansi Cobol And Supporting Programs**

PRINCETON, N.J. — Full Ansi (Level III) Cobol is now operational on Applied Logic Corp.'s AL/COM Time-Sharing Network, from 1 Plaza Square, 08540.

Related packages which expand the AL/COM Cobol system include COBSRT, a sorting program; Rerun, a restart program; DEB/COB, an interactive debugging program; COBRG, a report generator; LMAINT, a source library maintenance program; IMS, a support system for IBM IMS/360 users; and an Isam file organizer.

**Inventory System From FSS Geared to Banking Supplies**

ORLANDO, Fla. — Banks can impose better control over their supplies and reduce the value of stock on hand by as much as 25% with the Inventory Control package from Florida Software Service Inc.

The package is designed to print catalogs of available supplies for distribution to user departments, to update inventory amounts and to generate orders as needed. Written in Cobol and run in 24K of core under DOS on a 360/25 or larger CPU, the package costs \$1,200 and can be ordered from 988 Woodcock Road, 32803.

**Circuit Analysis Extended**

FAIRFIELD, N.J. — Engineers can experiment with design changes, prove circuit configurations and test operating procedures with Recal II, electronic circuit analysis language, through the Rapidata remote access facilities.

The new service includes analysis of multivalued circuits, data sharing between AC and DC, and transient analysis. Non-linear analysis, circuit modeling and direct acceptance of frequency functions are also available, the company said from 20 New Dutch Lane, 07006.

**ISC Offers Manipulator**

BRAINTREE, Mass. — Interactive Sciences Corp. now provides the Interactive Algebraic Manipulator on its advanced PDP-10 time-sharing services.

IAM, a product of Applied Data Research, Inc., is for scientists, physicists, mathematicians and engineers whose daily functions involve the creation and manipulation of expressions in algebra, calculus and arithmetic.

Interactive Sciences distributes the usage of IAM through its regional offices in Boston, New York City, Pittsburgh and Arlington, Va.

**Packages Give Flexibility to DOS Usage**

By Don Leavitt  
Of the CW Staff

Users still puzzling over what to do in the face of the "functional stabilization" of DOS for the IBM 360 can consider at least two packages from independent software vendors.

With Grasp from Software Design Inc., they can have many of the OS/360 features under DOS.

Using Duo 360/370 from Computer Technology Inc. (CTI), they can execute all their DOS-written programs directly under OS, without the IBM DOS emulator and without reprogramming.

Grasp allows the user to continue operations under the smaller DOS supervisor while providing such OS options as I/O spooling, relocatability for all programs except Maint, but including IBM compilers and application logic with overlays and dynamic partition balancing.

Grasp users consistently report 15% to 25% better utilization of their systems, but some have found even greater improvements, according to Software Design.

The program fits in 6K to 10K of core and costs \$7,500. The firm is at 999 North Sepulveda Blvd., El Segundo, Calif., 90245.

**Duo Supports 15 Jobs**

Elimination of the operator interaction normally required under DOS and the availability of OS spooling are cited by CTI as two of the major reasons for using Duo 360/370, even though it requires a core-consuming OS supervisor. Once in the OS environment, of course, the user is able to run 15 DOS or OS programs concurrently, with understandable improvements in processing times.

DOS users may continue to use the DOS compilers as well as DOS fetch load, and overlay facilities while functioning under Duo 360/370. DOS data sets will have to be altered to suit the OS mode, as will JCL cards.

Duo 360/370 adds between 6K to 15K per partition or region, for each DOS program. It can be leased from \$800/mo to \$1,600/mo from CTI, 7200 N. Stemmons Freeway, P.O. Box 47911, Dallas, Texas 75247.

**Sci-Tek, Others Offer 'System 2000'**

AUSTIN, Texas — System 2000, an advanced data base management system, implemented on IBM 360/370, Univac 1108 and CDC CPUs, is now available as a service from any one of three sources, according to the system developer, MRI Systems Corp.

The system is available through the facilities of Sci-Tek, Inc., Wilmington, Del., EPG Computer Services Inc., New York,

or Texas A&M University, College Station, Texas.

**Procedural Language**

Though many data base management systems have been announced, System 2000 is considered by MRI to be unique in its breadth of CPU implementations and in its support of both a procedural language for inquiry and retrieval chores,

and the user's choice of host language.

The basic System 2000 includes the ability to define new data bases, and to modify, retrieve or update values in existing, predefined bases. The user can define key data fields as part of the inverted file index which allows rapid processing of user requests.

To keep the basic system simple, the procedural language capability is an option along with a report writer, immediate access and sequential file processing.

**TP Monitor Feature**

For more effective processing under a teleprocessing monitor, System 2000 can include a TP monitor feature and multi-threading capability, the company said.

MRI Systems Corp. can be reached through P.O. Box 9510, 78766.

**PHI Tax Module Stands Alone Or Links to Payroll Systems**

ARLINGTON, Mass. — Maintenance of routines to calculate income tax withholdings can be "significantly reduced" through use of the Phitax module from PHI Computer Services Inc.

The ease of maintenance reflects the isolation of the tax rate tables in the new module, the company said.

Phitax was designed to be used with PHI's generalized Payroll System but can be used with most other systems as well, according to a spokesman.

During processing, program control is passed from the basic system to Phitax for calculation of taxes on regular, supplemental or any other type of payment.

The use of individual tax tables aids in the setting up of procedures, as additional jurisdictions impose taxes, as well as in the updating of preexisting rate structures, PHI said.

The module is written in Cobol and can be installed as a stand-alone package or as an enhancement to the PHI Payroll System. It may be used on most mainframes

that support Cobol.

PHI Computer Services is at 800 Massachusetts Ave., 02174.

**Banks Strengthen T/S Council**

CONCORD, N.H. — DP personnel in savings banks who wish to develop and then use an expanding number of management science programs, models, simulations and routines in a time-shared environment can use the facilities of the Savings Management Research Corp. (SMRC).

Interactive programs now available through SMRC allow management to know the bank's tax position at any given date during the year, or compute the after-tax return of different types of investments.

An outgrowth of the Savings Banks Time-Shared Council, SMRC is also expected to carry on a continuing program

of research designed to adapt the latest quantitative analysis techniques to savings bank management problems, and to publicize the techniques and the programs developed.

Many of the general-purpose programs that can be accessed through SMRC are also available directly through the Dartmouth Time-Sharing System which was the start point of SMRC. However, the specialized banking programs which SMRC has sponsored are available only to its members, a spokesman noted.

More information about SMRC is available from the New Hampshire Association of Savings Banks, 3 Capitol St., 03301.

**Value Computing, The Innovative Schedulers...Case History No. 7**

A large insurance company with over 3500 personnel in its home office and a total insurance in force exceeding 36 billion dollars.

The company has five UNIVAC (RCA) Spectra 70's, two of which are time sharing; over 100 switchable peripheral devices; seven second-generation serial processing machines. Teleprocessing is done on a batch machine used as a front end and a virtual machine as the back end.

The company uses an automated job scheduling and control system installed by Value Computing. Schedules are produced once each day for a 24-hour period for each machine. Automated scheduling has allowed them to more than double the number of jobs scheduled on their systems and increased the amount of multi-programmed hours by 40%.

For more details about this success story, and other case histories, contact Value Computing Inc., the Innovative Schedulers.

Value Computing Inc.  
383 Kings Highway North  
Cherry Hill, N.J. 08034

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Photomicrography of the XCP core memory

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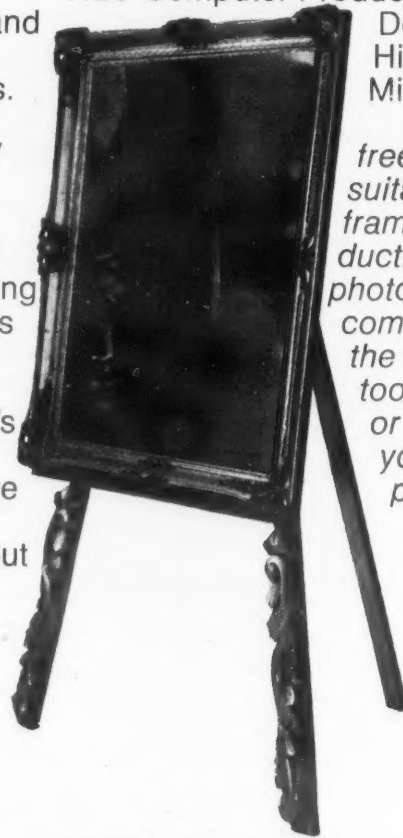
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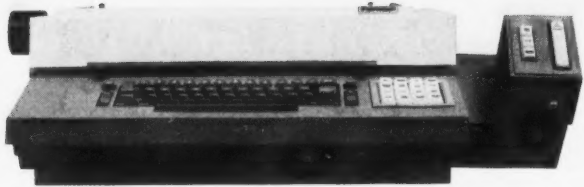
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**GTE INFORMATION SYSTEMS** INCORPORATED

## Cobol Programs Built With 'IQ-170'

BURLINGTON, Mass. — Programmers and analysts working with IBM 360/370 or HIS 200 Series CPUs can do basic Cobol programming tasks quickly and inexpensively with the IQ-170 source language generator from Synergetics Corp.

The \$900 package generates coding based on free-format, keyword parameter entries and will produce programs that can accept one or two input files, and create a report and an output file. The files can be on magnetic tape, disk or cards.

Within the Procedure Division, IQ-170 can select, copy, update,

merge and reformat files. There are no arithmetic operations supported directly by the package, but it does include exit points at which the user can invoke his own routines, coded in conventional Cobol or any other language.

Output reports are automatically formatted, and detail or summary reports can be created with up to nine levels of totals, using the IQ-170 parameters.

Not more than one record format can be coded for each file. Users requiring more extensive record choices may code and

insert them in the generated source code before it is compiled.

The Cobol source code produced by the package is basic enough to avoid conflicts with any of the compilers used on either the IBM or Honeywell equipment, Synergetics said.

The extent to which IQ-170 can reduce the programmer's workload is illustrated by a sample run provided by the company. In that instance, 10 IQ-170 parameter cards generated 325 Cobol cards, including a number of comment cards in the Identification Division, to describe the program.

IQ-170 will operate on the IBM 360/370 with 32K bytes of core under DOS, or on the HIS 200 line with 20K characters of storage.

Users are provided object code, and a reference manual, as well as the sample program. Full program maintenance is also included in the \$900 price.

The company is at One Garfield Circle, 01803.



## 'Reely' Flexible

Dylakor Corp. has developed a flexible tape reel (for which it has now asked patent protection), as a means of distributing programs. The FTR package consists of a loop of acetate, which forms the tape reel itself, with about 100 feet of tape wound on it, and a length of lightweight polyvinyl tubing. To keep the tape uncontaminated by dust, the tubes, with the FTRs inside, are sealed in plastic bags during transit. The FTRs cost \$2.95 each, minimum orders of six, from 16625 Satcoy St., in Van Nuys, Calif.

## Service Punches Pick of 47 Codes

MOUNTAIN LAKES, N.J. — Data collection, order entry and personnel systems are among the applications that can be enhanced through a plastic card punching service from Datron Systems Inc.

Datron has dies with which it can punch plastic cards in any of 47 different codes. These include both old, round-hole, and new, rectangular, telephone dialer codes. Otherwise, numeric or alphanumeric Hollerith, RCA format and BCD modifications of other codes are also available.

Data for punching can be taken from user-provided printed lists, 80-column punched cards or magnetic tapes. Data previously embossed on a card can be read and then punched back into the same card for users who need both forms of coding.

Plastic cards may be supplied by the user or by Datron. Datron can provide hot stamp embossing, carrier mounting and mailing services.

Cost of the card punching service depends on how many characters are punched in each card and how many cards are prepared in all, as well as the source of the numbering or coding data. The service may range from as little as \$10/1,000 cards punched to as much as \$50, a spokesman estimated.

Services beyond punching will add to the basic cost, he added. Datron Systems Inc. is at 100 Route 46, 07046.

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## Bits & Pieces

### Beta Adds Two Printers To 600L and 700L COM

NEWTON, Mass. — Development of two peripherals for the Beta COM 600L and 700L Systems by the Gould Data Systems Division can create a processing system with considerable flexibility.

The two peripherals are an impact printer that can print 132-character computer print lines at 600 line/min (Model 920 medium-speed printer) and a non-impact electrostatic printer that can print 132-character computer print lines at 3,000 line/min (980 high-speed printer).

Initial deliveries of the two peripherals will be made within 90 days. Purchase price for the 980 high-speed printer is \$23,000; and \$19,500 for the 920 medium-speed printer.

Gould Data Systems is at 20 Ossipee Road, 02164.

### DEC Offers Used PDP-8s for Sale

MAYNARD, Mass. — DEC is selling reconditioned 165 minicomputers previously used either as demonstrators or in-house systems.

The 4K PDP-8/I and PDP-8/L minicomputer mainframes and systems offered are priced beginning at \$2,500 and are available for immediate delivery.

Each computer is offered with free installation, a full 30-day warranty, automatic eligibility for a DEC maintenance contract, and a complete software package including prints and diagnostic programs. Customers are further eligible for factory training classes and membership in DEC's user society.

### Tablet Usable On- or Off-Line

MONROEVILLE, Pa. — The Grafacon 1010A, from Compunetics, Inc., based on the Rand tablet, is a digital input device for on-line or off-line operation.

Off-line capabilities include mag tape, paper tape, digital display or CRT display. In an on-line mode, curves, traces, drawings, maps or a list of symbols can be processed in an interactive mode when used with a CRT or plotter.

The 1010A is available in a desk size console or a convenient desk-blutter configuration. The input device is a pen-like stylus, available in either a writing or non-writing model.

The Grafacon 1010A is priced at \$6,950. Delivery is 60 days from 1100 Eldo Road, Monroeville Industrial Park, 15146.

### Cooling System Converts Fast

CHERRY HILL, N.J. — Edpac's Universal System can handle cooling and humidity requirements for small computer rooms and converts easily for future expansion. It takes 10 minutes to convert the system from upflow to downflow for use with a raised floor.

Initially, the Universal provides 5 and 7.5-ton capacity. Universal was specially designed for future expansion. Add-on of process cooling modules, Universal/Slaves, reduce the cost of later expansion, the company said.

The company is at Old Cuthbert and Deer Roads, 08034.

### User Tests IBM 2311

## Independent Drive Proves 10% Faster

By Frank Piasta  
Of the CW Staff

ROANOKE, Va. — An average performance increase of 10% was achieved by substituting an independently supplied disk drive for an IBM 2311 in a series of benchmarks at the Lewis-Galen Hospital and Clinic here.

The tests compared the 28% lower-priced Memorex 630 disk drive and the IBM device when attached to a 24K IBM 360/22 under DOS.

The jobs used in the benchmark were selected as representative of average processing combinations in a normal batch-processing environment, according to director of computer services, Mickey D. Schmidt. They included link-editing, program compilation/assembly, file processing and sorting.

### Improvement of 20%

The largest improvement, 20%, occurred in a file processing application which called for a sequential disk file to be copied to a magnetic tape, the disk packs changed and the file recopied to the new pack. The smallest increase, 2%, was achieved in a job for the summation of a sequential disk file using a catalogued program, with no link-editing required.

The test was designed to measure the change in total run time, measured by the CPU interval timer; concern itself with disk-bound jobs, primarily; use identical job runs of a typical variety; and have the results quantified by averaging and rounding both percentage ratios to the nearest whole percent, Schmidt explained.

The first phase of the test involving link-editing an object deck saw an improvement of 10% for the Memorex drive.

An RPG program was compiled in 3% less time with the Memorex drive on line. An improvement of 4% was found in each of the two assemblies performed.

File processing applications showed the widest range of variances. The copying of three sequential disk files to one tape

volume showed a 3% improvement. A job that called for a tape file to be read, data validated, results printed, batch sequential files written to disk and the disk file copied to another disk area showed a change of 5% in favor of the Memorex unit.

The program was then modified to move the accumulating file to a batch location and merge the two files to the original area while file extents were accumulated. Improvements of 7% to 11% were achieved as the size of the accumulating file was increased in successive runs.

The merging of two tape files with one

sequential disk file and the results written as another disk file showed an improvement of 3%.

A sort of 6,933 records in two ascending numeric sort keys resulted in a change of 16%. An improvement of 10% was achieved by a sort of 24,309 records in two ascending alphabetic sort key orders.

Schmidt stressed that all jobs included in the test ran faster with the Memorex drive in the system.

The greater the ratio of disk-bound jobs to other I/O-bound jobs, Schmidt concluded, the greater the overall benefit derived from the Memorex drive.

## NCR Alters Punched Card Units Available With Century Systems

DAYTON, Ohio — NCR has revised the punched card equipment for its Century series of data processing systems.

The company has introduced two card reader/punches and two card punches for Century 100, 200 and 300 systems. Three machines, including a reader/punch, reader and punch, can now be attached to Century 50 systems.

Two other Century card devices, a reader/punch and a punch, were discontinued.

The 686-102 card reader/punch reads 800 card/min and punches from 83 to 294 card/min, depending on the number of columns to be punched. The 686-302 card punch operates at the same speed.

The second of the new reader/punches, the 686-111, can read cards at 560/min, and punch at rates of from 60 to 180/min. The 686-311 card punch has the same output rate, NCR said.

Three of the devices, the 686-111 reader/punch, the 686-201 reader and the 686-311 punch, are available for the Century 50, the smallest processor in the series.

The free-standing units are not intended

to replace the card reader as part of the Century basic systems, but rather to add additional capabilities to the processors, NCR explained.

The lease price of the 686-111 card reader/punch is \$400/mo. The purchase price is \$20,500 with \$115/mo for maintenance. The 686-311 card punch leases for \$300/mo and sells for \$14,750 plus \$115/mo for maintenance. Both will be available during the first quarter.

The 686-102 card reader/punch has a lease price of \$500/mo and a purchase price of \$24,000 with \$115/mo for maintenance. The 686-302 card punch has a lease price of \$400/mo and a purchase price of \$20,500 plus \$115/mo for maintenance. Deliveries of both units will begin in the second quarter of 1972.

The 686-201 is available at a lease price of \$300/mo or can be purchased for \$14,750 plus \$75/mo for maintenance. The 6051 common trunk feature is priced at \$150/mo. A 60% educational discount on the feature has been instituted.

The discontinued units are the 686-101 reader/punch and the 686-301 card punch.



### 1 of 3 RJE Systems

The DECcomm 11D21 is one of three data communications systems. Along with the DECcomm 11D26, the remote job entry system lets users expand their IBM 2780 RJE capabilities. Identical hardware includes a PDP-11/20 mini with 8K core memory, synchronous communication line interface and a real-time clock. Price for the 11D21 begins at \$22,350 and for the 11D26, \$18,350. The third system, DECcomm 11D20, has the same mini configuration as the other two, with a Comtex 11 system control and interface software, for a price of \$16,000. Deliveries begin in April.

## COM Get fat and happy

If you'd rather run tapes and films to service bureaus and film labs than relax, the Quantor 100 microfilm recorder is not for you. It converts reels of tape to rolls of 16mm microfilm while you have coffee and Danish.

## Quantor

19000 Homestead Road, Cupertino, California 95014 (408) 255-1000; Oak Brook (Chicago) (312) 654-3720; New York, N.Y. (212) 279-3280; Washington, D.C. (703) 524-1941; Los Angeles, Calif. (714) 833-0157



## 'Inhibits Growth'

# Whitehead Raps Extensive Regulation

NEW YORK — Detailed regulation of telephone services can "inhibit the growth of communications services," according to Clay T. Whitehead, director of the Office of Telecommunications Policy.

Speaking before a meeting of the Conference Board, Whitehead said computer information services "must operate within an economic and technological framework when information services draw on communications as well as computers."

The OTP director contrasted this restrained regulatory environment with "raw computing power and associated equipment and software" which he said are "provided in a competitive environ-

ment that is quite responsible to social and individual consumer needs."

### Origin of Trouble

"Much of the trouble in the present communications industry" can be traced

## Communications

back to the Communications Act of 1934, Whitehead said. The act, which established the framework for the Federal Communications Commission, assumed the communications industry was characterized by natural monopoly, he said. It also assumed "extensive regulation is necessary to prevent resulting monopolistic abuses," he stated.

"Instead we find that more and more communications enterprises can be competitive in nature. And... we find that regulation affords not just consumer protection, but also uncertainty, delay and expense," he said.

### 'Force of Habit'?

An important question, Whitehead said, is whether regulation as a substitute for competition was "really justified or only due to force of habit?"

Implying that some basic changes had to be made, Whitehead said there is a limit to how far current regulations can be stretched to "accommodate new information technology." For example, he said it would be difficult to determine whether a CRT display was a "copy" that falls within "the procedural requirements of our 63-year-old copyright law."

## Canadian Group Set

OTTAWA, Canada — Canadian Telecommunications carriers have formed an organization to coordinate views and policies affecting all aspects of communications.

Made up of 23 carrier organizations including telephone companies, and the Canadian satellite carrier, Telesat, the organization will be known as the Canadian Telecommunications Carriers Association (CTCA).

One of the major aims of CTCA will be to develop telecommunications services to meet business and social needs within Canada and the rest of the world, according to a spokesman.

CTCA will establish a policy committed to deal with important communications in Canada.

Malcolm N. Davies, vice-president of Bell Canada, has been named general manager of CTCA. The organization will be based at 1 Nicholas St., Ottawa.

## CSMA Seminar Set On Interconnection

WILMINGTON, Del. — The Communications Systems Management Association will hold a regional seminar dealing with various aspects of interconnection on April 24, in New York.

The all-day session will cover the usage of non-carrier equipment by data and other users. Scheduled to appear at the session are representatives from both government and industry.

Ralph Bergland, a communications consultant, will discuss the history of interconnection and currently available equipment. The highlight of the meeting is expected to be a presentation by Louis Feldner of the Federal Communications Commission interconnection staff who will discuss the current regulatory status of pending interconnection problems.

The seminar will be held at the New York Statler Hilton and will be open to members and non-members of CSMA. Details are available from Thomas Richfield, Communications Systems Management Association, Suite 303, 1102 West St., Wilmington, Del., 19801.

## GE Adds 300 bit/sec Data Set to Diginet

LYNCHBURG, Va. — GE has added a 300 bit/sec data set with automatic answer capability to its Diginet family.

Designated the 1103, the unit is compatible with Bell 103 modems and can be used with AT&T's CBS or CBT data access arrangements, GE said. By using a single computer port for both origination and answer modes, the 1103 can save time by eliminating a manual interface between remote terminals and the CPU, GE said.

Although cost of the 1103 is based on exact configuration, a spokesman said the unit is priced at "about \$200 to \$300 per channel." The 1103 is available for delivery in about 120 days from GE Communications Systems Division, 25402.

## Multiplexer Intermixes Transmission Modes

LOS ANGELES — Computer Transmission Corp. has introduced a time division multiplexer unit to intermix both asynchronous and synchronous transmission modes on dialup and dedicated lines.

Designated the Multitran 1100, the multiplexer can interface with Bell modems operating at 2,400 to 9,600 bit/sec, according to CTC.

The Multitran 1100 has built-in remote loopback test and on-line fault isolation capabilities. The basic unit is priced at \$3,550, plus a unit charge (depending on data rate) for each terminal port. Delivery is 60 days from 1508 Cotner Ave., 90025.

# Century Data's "more than

### PERFORMANCE SPECIFICATIONS Capacity

### Transfer Rate Access Time Track-to-track Full Stroke

### Rotational Speed

### Pack Start/Stop Time

### Disk Pack Characteristics Disk Pack Required

### No. of Recording Surfaces

### No. of Tracks/Surface

### Special Feature

### CDS-111 / CDS-133

7.25 M bytes

1.25 Mbits per sec.

10 msec.  
65 msec.

2400 RPM  $\pm 2\%$

30 sec. to operating speed;  
10 sec. to stop

IBM 1316 or equivalent

10

203

CDS-133: direct replacement for Control Data model 9433/9434

### CDS-114

29.2 M bytes

2.5 Mbits per sec.

10 msec.  
65 msec.

2400 RPM  $\pm 2\%$

22 sec. to operating speed;  
12 sec. to stop

IBM 2316 or equivalent

20

203

Electromagnetic head positioning and electronic track detenting

### CDS-214

Per pack — 29 M bytes  
Per Unit — 58 M bytes

2.5 Mbits per sec.

10 msec.  
65 msec.

2400 rpm  $\pm 2\%$

22 sec. to operating speed;  
11 sec. to stop

IBM 2316 or equivalent

20

203

Two independent disk drives in a single cabinet

### CDS-215

Per Pack — 58 M bytes  
Per Unit — 116 M bytes

2.5 Mbits per sec.

10 msec.  
55 msec.

2400 rpm  $\pm 2\%$

90 sec. to operating speed;  
11 sec. to stop

IBM 2316 or equivalent

20

406

Optical detent sensing



# Intelligent Terminals Meet Need for On-Line System

NEW YORK — Union Carbide, with 15 consumer products sales offices across the country, each with a nearby warehouse, was contemplating a massive on-line order entry and inventory network with terminals feeding a dedicated central computer in New York.

It immediately became obvious that a large network of terminals would necessitate installation of a dedicated central processor. The projected on-line network would also require development of extremely sophisticated on-line software to support remote terminals. And after configuring its requirement, the firm found the leased line network would run \$50,000/mo.

At this point, in the fall of 1969, the DP management of the Consumer Products Division began looking at intelligent, stored program terminals.

Why couldn't an intelligent terminal do all the editing that otherwise must be done at the central computer?

Since such a unit has memory and peripheral capabilities, why couldn't the terminal keep track of inventory?

Why couldn't a terminal be placed in a warehouse location to act as a central processor by polling the terminals in sales offices?

Consumer Products original design objectives could be met with a "terminal-to-terminal" network. The only communications costs would be local lines connecting sales offices to associated warehouses.

Today, the Consumer Products Division has 76 Burroughs TC 500 terminal computers installed in 15 sales offices and associated nearby warehouses. Each sales office has three or four while the warehouses have two. All programs were prepared by Carbide's staff.

Orders are received with products listed in random sequence. An edged punched card product file is maintained for all Consumer Products Division items. These

product cards contain such information as product line, normal originating shipping point, freight code, weight, quantity per packing unit, standard price and other pertinent product information. The terminal operator selects the proper product card, inserts it in the terminal, and uses the keyboard to enter the quantity ordered.

Internally, the terminal separates each product into the appropriate product category, as well as performing the line item and weight extensions. The terminal then determines whether this item is in stock or is located in a different warehouse. If on back order or located elsewhere, a separate document is created, separating the customer's order into the proper number of shipping documents.

Output is a "product scroll" and a punched paper tape with the line items formatted in the same product grouping sequence in which they must appear on the shipping document.

Under the new system, the order document preparation is virtually automatic. The customer information comes from a prepunched master file customer tape. The product information comes from the product scroll — output punched paper tape. The only data the terminal operator is required to enter is the variable data, such as special instructions.

After a complete order is entered, the pertinent data is transmitted via telephone line to the warehouse terminal, which automatically prepares shipping documentation.

The split platen of the TC 500 enables two forms — the shipping document and the bill of lading — to be separately controlled and printed by the warehouse terminal.

As the documents are prepared in the warehouse, an output paper tape is created which reflects the appropriate stock keeping unit number identifying the proper carton quantity of an item in the warehouse along with the total quantity of each item to be shipped. This paper tape is then processed daily by an off-line TC 500 in the warehouse.

Two programs called "invent" and "demand" are run on this second unit. The "demand" program summarizes sales to all customers by item and product group for the day. The "invent" program combines the previous day's available balance of each item stocked in the warehouse with the day's product order activity to determine the actual inventory balance available for shipping the next day.

As the "invent" program is run, the TC 500 compares the day's total demand to the available balance. If the demand exceeds 10% of inventory, the item is identified on the inventory report by a printed asterisk next to the item. For the benefit of management, an "action item" report is automatically printed on the other side of the split platen listing item number, demand and available balance for those items whose demand has exceeded 10%.

The terminals in each warehouse also summarize the inventory demand on a weekly basis for an "orders received" report. Each warehouse prepares the orders received by product series and transmits them to the central production group in Cleveland, Ohio, where this information becomes the basis for management reports analyzing the sales of specific products.

Another output paper tape, produced at the sales office as a byproduct of the order document preparation, contains all products entered at the sales office for the day. It is transmitted to the New York computer center where it is used as input to a pricing and billing system.

Any line items that are not shipped from the warehouse, because they are on back order, will be indicated on the "shipment of products" report. Only the exception items are entered at the warehouse since all entered merchandise has already been entered into the pricing and billing system as an open order. The shipping information is then transmitted to New York for entry into the pricing and billing system.

The shipment of product data automatically releases an order from open status and establishes it as an item that should be billed. Any back orders or products to be shipped from other than the originating warehouse generate an output paper tape which is transmitted the following morning from a TC 500 at the Tarrytown, N.Y., Technical Center directly to each warehouse throughout the country. The appropriate shipping documentation is then created on the warehouse terminal, assuring one day turnaround from the order preparation date to the time the proper shipping documents are prepared no matter where the item is stocked.

## equivalent to" disk drives ...and now a tape transport

### CDS-230

Per Pack — 100 M bytes  
Per Unit — 200 M bytes

6.45 Mbits per sec.

10 msec.  
55 msec.

3600 rpm  $\pm 2\%$

15 sec. to operating speed;  
15 sec. to stop

IBM 3336 or equivalent

19 (plus one pre-recorded surface)  
411

High velocity air flow system

### Tape Drive

### Tape Speed

### Recording Density

### Tape Loading

### Start/Stop Time

### Rewind Time

### Transfer Rate

### Tape Characteristics

### Type

### Reel

### Hubs

### Special Feature

### CDS-340

### Single Capstan

### 75 to 200 ips

1600 bpi PE, 800 bpi NRZ-I (9-track) 800, 556, 200 bpi NRZ-I (7-track)

Fully automatic with or without cartridge; 7 sec. @ 200 ips, 10 sec. @ 75 ips. Automatic BOT searching.

2 msec.

45 sec. to 70 sec. maximum

Up to 320,000 bytes/sec. peak @ 200 ips.

1/2 inch, 1.5 Mil Mylar, 1600 bpi certified  
Standard up to 10 1/2" with or without tape cartridge  
CDS power-operated

Fixed air bearing surfaces



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# Computer Users' Forum & Exposition

The National  
Computer Conference  
That's Coming To You

## The Need

The computer age is moving into a new stage. Until now, computer makers have dominated the scene, introducing one breakthrough after another in the state of the art. The time has come to pause and consider the computer user. You need more opportunity to improve on the systems you now have.

## The Solution

A Computer Users' Forum, run by professionals and designed to bring regional users together in manageable groups to discuss mutual EDP problems with other users, and with regional and national experts... and a chance to study and evaluate new equipment and services that will be shown in the presentations of leading EDP suppliers comprising the Exposition.

## The Format

- Each Day 9:00-9:40 Keynote address by a nationally known expert — an independent, not a vendor — on the day's main subject. Sets the stage for discussions.
- 9:40-10:30 Panel discussion led by regional experts chosen for their progressive management principles. Questions encouraged.

10:40-11:45 Workshops — panel members conduct separate workshops. Your specific questions fielded, worked out.

12:15-1:30 Conference luncheon — keynote speaker summarizes chief points covered during panels and workshops.

1:00-9:00 Exhibits open, stay open til 9. Exhibitors will show the latest in hardware, software, services.

## The Subjects

### First Day: Data Entry

Keynote speaker; Lawrence Feidelman, President, Management Information Corp., Cherry Hill, N.J.; Editor, *Data Entry Today*.

*Panels and workshops will be grouped by these four subjects:*

- Keypunch replacement; key to tape, disc and cassette devices.
- OCR.
- Intelligent terminals — distributed processing.
- Direct data entry/source data automation.

### Second Day: Data Communications: The Choices

Keynote speaker; Dr. Dixon Doll, Data Communications Consultant, faculty member, Graduate School of Business, Eastern Michigan University.

*Panels and workshops will be grouped by these four subjects:*

- Communications equipment from main-frame makers and common carriers.
- Communications equipment from independent suppliers.
- Data transmission via private (lines, microwave) networks.
- Data transmission via carriers (lines, microwave).

### Third Day: Operational Efficiency

Keynote speaker; Charles Lecht, President, Advanced Computer Techniques, N.Y., N.Y., author of *The Management of Computer Programming Projects*.

*Panels and workshops will be grouped by these four subjects:*

- Core extensions.
- System/utility software modifications.
- Independent peripheral usage.
- Dedicated systems vs. general purpose computers.

### Panel Members & Workshop Leaders

The regional experts who will run the panels and workshops have been chosen from a wide range of firms and institutions. Some will participate in more than one session, depending on their experience and expertise.

## PLAN NOW TO ATTEND

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Computer Caravan is a division of Computerworld, the Newsweekly of the Computer Community.

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to provide a better Forum for you.

PLEASE CIRCLE ONE NUMBER  
IN EACH CATEGORY

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- 01 Mining/Construction/Oil & Refin.
- 02 Manufacturing — Computer or data system hardware, peripherals / other associated mechanical devices
- 03 Manufacturing (other)
- 04 Utilities/Comm. Sys./Transport.
- 05 Wholesale/Retail
- 06 Finance/Insurance/Real Estate
- 07 DP Serv. Bureaus/Software/Plann.
- 08 Business Services (except DP)
- 09 Education/Medical/Legal
- 10 Federal, State and Local Govt.
- 11 Communications/Printing/Publ.
- 12 Other:

#### YOUR FUNCTION

- 01 Corporate Officer
- 02 Data Processing & Other Operational Management
- 03 Data Processing Professional Staff
- 04 Consultant
- 05 Lawyer/Accountant
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Mail this registration form to:

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Computer Users' Forum & Exposition  
797 Washington Street  
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#### Exposition Sites & Forum Schedule Please Check City Where You Will Attend

City	Location	Dates
<input type="checkbox"/> Washington, D.C.	Washington Hilton	Mar. 7-9
<input type="checkbox"/> Atlanta	Regency Hyatt House	Mar. 14-16
<input type="checkbox"/> Dallas	Market Hall	Mar. 21-23
<input type="checkbox"/> Los Angeles	Ambassador	Apr. 4-6
<input type="checkbox"/> San Francisco	Fairmont	Apr. 10-12*
<input type="checkbox"/> Chicago	Palmer House	Apr. 18-20
<input type="checkbox"/> Detroit	Cobo Hall	Apr. 25-27

Please register me for:

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☐ OPERATIONAL EFFICIENCY — Day Three; ☐ EXPOSITION ONLY

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The above prices include all workshop materials, luncheon, and admission to the Exposition Hall.

☐ \$5.00 for Exhibits only.

TICKETS WILL BE HELD IN YOUR NAME AT THE DOOR. FOR MULTIPLE REGISTRATIONS PLEASE COPY THIS FORM AND USE A SEPARATE SHEET FOR EACH REGISTRATION.

\*Monday-Wednesday Schedule



# DP Course for Students Sparks Faculty Interest

At IBM's symposium for deans of schools of business held last fall in Endicott, N.Y., two hours were spent discussing ways to motivate faculty to use the computer themselves and to encourage their students to do the same. The conclusion was that the student is the most important motivator in schools where a basic computer course is required.

It is, however, essential that

the introductory computer courses emphasize the value of the computer in the various disciplines. One way to insure this is to require students in that course to write computer programs to solve homework problems in other business courses they are taking that semester.

Once such an environment is established, instructors in the functional area courses find themselves being asked whether it is alright to write a computer program, or if there are programs in the university library which could be used to solve the assignment.

The instructor is motivated to find out something about the availability and the limitations of computer programs in his discipline.

Students can also be motivators at the upper division course level. Instructors of quantitative courses can encourage students to build models for applications in their major areas of study, instead of assigning only the traditional production applications. Students usually ask instructors in their major fields to aid them in selecting appropriate models; in this manner, the faculty becomes involved.

Faculty are motivated to acquire computer proficiency when they see their peers effectively using the computer. Also, they see that other instructors with computer capability have increased consulting opportunity!

Some deans and department chairmen feel they have little impact on motivating faculty to become effective computer users. In fact, the dean can have a significant impact through facilitating faculty education.

Some of the successful approaches of the deans at Endicott were:

- Providing in-house faculty education programs, with release time for the instructor.

- Establishing internships in industry.

- Providing travel funds to attend courses taught by the professional societies.

- Allowing release time of one course, to acquire a proficiency through self-study.

- Assigning basic computer courses to a functional area faculty member who wants force-feeding.

Several deans have used the approach of selecting an influen-

tial faculty member and providing time and funds for him to become computer-proficient. The only stipulation was the sharing of his new knowledge with others in his department both as an instructor and an adviser.

Some of the deans at the Endicott symposium stated their faculty reward system reflects the importance of innovation. Effective use of the computer in teaching certainly fits into the category of innovation, in the view of the deans.

The dean's personal commit-

ment was crucial in demonstrating the importance of computer proficiency for faculty. In schools where the dean attended a DP education seminar, the faculty responded positively.

Also, the dean who uses the computer himself demonstrates the validity of computer education for potential managers.

Perhaps the most important way a dean demonstrates his belief in the value of computer curriculum is by providing adequate computer accessibility.

The minimal level of computer proficiency would be that which

enables the faculty member to be a satisfactory "adviser" to students concerning computer use. He would be able to advise students which assignments are appropriate for computer solution. He would understand the limitations of computer programs available in the school's library.

The optimum level of computer proficiency would enable a faculty member to design and write computer programs for teaching and research. He would use the computer in teaching in addition to his research.



**J. Daniel Couger**  
On  
**Education**

Couger is professor of Computer and Management Science at the University of Colorado.

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## Afips Leaves Las Vegas, Changes Fees In Effort to Bolster JCC Attendance

By Edward J. Bride  
Of the CW Staff

MONTVALE, N.J. — The 1972 Fall Joint Computer Conference is moving further west.

Although Spring Joint will still be held in Atlantic City from May 16-18, the Fall Joint Computer Conference will move from Las Vegas to Anaheim,

### Societies/ User Groups

Calif. The dates have been changed from before Thanksgiving to Dec. 5-7.

Keith Uncapher, president of the American Federation of Information Processing Societies (Afips), sponsor of the JCCs, said the decision to move from Las Vegas had "not been an easy one."

According to plans announced last year, Afips

was investigating several more cities, such as Boston, Philadelphia, and Anaheim, as alternatives to the convention "headquarters" in the East and West portions of the country.

A diminishing number of exhibitors and attendees prompted consideration of alternate sites last year.

"In view of the still uncertain economic outlook, we believe it essential that the JCCs be held at sites close to the population centers of our field," Uncapher noted.

The Anaheim location will facilitate increased attendance from the greater Los Angeles area, Uncapher predicted, "especially on the part of individuals wishing to spend only one or two days at the FJCC."

#### New Fee Structure

A new one-day registration fee, to be inaugurated at SJCC in May, will have added impact on Los Angeles area users next fall, he indicated. The new fee schedule will enable many individuals to attend "without the necessity of extensive travel arrangements," Uncapher added.

The one-day registration will cover attendance at both the Technical Program and the exhibits, for \$15. A separate \$5 one-day exhibits-only registration will also be available.

Single day registration fees do not include a copy of the conference proceedings, although this compendium of technical papers may be purchased separately.

Afips also cut full registration fees for non-members of its dozen constituent societies. Pre-registration for non-members will be \$40, a \$10 reduction, and conference-site registration will cost \$45, a \$15 drop.

Full information on SJCC is now available at Afips's headquarters, 210 Summit Ave., 07645.

## DUO 360/370 shrinks OS manpower conversion costs up to 90%.

Going from DOS to OS is a battle. For one thing, programmer man-hours are monstrously inflated by the need to reprogram everything from DOS. With DUO 360/370 you get OS results without reprogramming.

For another, OS test time is an obstacle. DUO cuts it by as much as 90%.

And in the conversion, departmental morale suffers heavily. DUO removes the pressure, by removing the need to reprogram everything at once.

What is DUO 360/370? Some kind of knight in shining armor?

If you're captured in the OS conversion process, it is. Because DUO permits most DOS object programs to fully access OS facilities without reprogramming. Your DOS supervisor is not needed. And that makes DUO unique in

the marketplace.

It's been in operation at blue chip companies across the nation for over a year now. Try DUO 360/370 free, on your own computer, and prove it for yourself. Simply call me, Jack Keen, Director of Special Products, (214) 637-5010, or write.

Gentlemen: I'm interested in a free trial of DUO 360/370 on my equipment.

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## Hopper Dissertation On DP Distribution

NEW YORK — The move toward distributed computing will get a boost here this week (March 8-10) at an American Management Association briefing on "Systems of Computers: The Dispersal of Computing Power."

The session, following AMA's 18th Annual Systems Management Conference, will focus on how the user can prepare for the transfer of DP responsibility, the emerging data communications networks, and software and hardware for distributed computing.

The session will be keynoted by Cmdr. Grace Hopper who will present the case for decentralization of computer power, including closer management involvement, response time and inter-departmental rivalry over computer systems.

A major portion of the meeting, which will be co-chaired by Dr. Carl Hammer, director of computer sciences at Univac, and William J. Horne, assistant vice-president at U.S.M. Corp., will be devoted to data communications, and will stress the present systems, future requirements, network optimization, software considerations, front-end computers and the problems of privacy and security.

## New RCA User Group?

ATLANTA — The RCA Computer Users Association will find itself with one more special interest group, if the efforts of several members are successful.

Led by Donald Watnick, manager of systems and software support for Arthur Young & Co., the members are trying to organize DOS users, currently numbering over 100, according to Watnick.

The first meeting is scheduled for the next users' meeting on May 21 at the Shamrock-Hilton in Houston.

## Corrective Action Goal of GM Accident-Cutting Plan

DETROIT — Safety engineers at Detroit Diesel Allison Division of General Motors are counting on a computerized data program to further reduce accidents at its facilities here.

Accident Reduction Through Injury Computerization, Artic, is also expected to show a fall-off in safety costs along with an

increase in departmental efficiency, according to Bruce Podzius, safety director.

Artic will chip away at unsafe work habits and at the method set up for doing particular jobs.

Any injury requiring medical attention is recorded by the medical department, covering the employee's name, Social Security Number, time and date of the visit.

### Medical Form

The attending nurse fills out a medical form, including the employee's sex, work shift, type of

injury, the body area injured, the cause, medical disposition and the length of job restriction, if any.

Following treatment, the employee takes a copy of the form to his foreman, who must check on the back one of three answers to the question, "What have you done to prevent a future accident of this nature?"

- Employee was reinstructed on safety operations of his job.

- Safety work order was issued to change the job method.

- Other (with an explanation)

The form is then dropped in

any plant mailbox and is delivered to the safety department where engineers compare corrective action by foremen with the Artic printout it receives regularly from the DP department.

The computer's obvious contribution, Podzius said, is in delivering quick, accurate and complete information on which to base management priorities for corrective action.

The printout will spotlight problem areas wherever they are — whether it's a high-injury employee, a particular job or a department, he said.

## Cameo Collects Latest Cancer Treatment Data

COLUMBIA, Mo. — A data bank, developed by two researchers at the Cancer Research Center here, is being used to make optimum use of the latest cancer treatment techniques.

Dr. Carl Knutson and Francis Watson believe the center's program, Cameo (Cancer Management and Education Optimization), promises not only to give surgeons and medical students the most current treatment information, but also to improve medical services in remote areas.

"Data from the actual experience of surgeons, and the logic a cancer specialist would use to get to the best treatment, have been incorporated in Cameo. Now, we feel, a system can evolve which will include all forms of cancer, to be updated as better treatment becomes known, to be changed as more precise knowledge emerges from anywhere in the world," according to Watson, associate director of the computer facility and chairman of the research center's biomathematics department.

In a series of a dozen questions, the Cameo computer program attempts to identify the kind, size, condition and precise location of the cancer.

In less than a minute, the IBM 360/50 works its way through the decision-making model Knutson and Watson developed and displays the various treatments in order of effectiveness.

# 370/360

In conjunction with the Company's 370 leasing program, CSA purchases pre-owned 360 equipment and peripherals either for short term leaseback, or immediate purchase and lease to other users.

CSA's legal and financial staff will promptly negotiate and document all transactions.

Companies interested in upgrading and obtaining 360 or 370 equipment may call J. Frank Keohane at (617) 482-4671.



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in the industry.  
HP's got it.**

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compact,  
most reliable  
1600 CPI tape unit.  
We've got  
that too.**

It's the new 7900 with a 35 ms average access time and 5 megabyte capacity. That means large files can be stored and retrieved quickly on-line.

The 7900 uses both a fixed disc and a 2315 type cartridge which can be changed in less than one minute. The dual disc configuration allows additional data stored off-line to be placed on-line fast. And it also enables data and programs to be duplicated for back-up capability on a single drive.

Rugged design ensures that heads stay directly over data even during severe shock, vibration, pitch or roll. For instance, the 7900's photo-optical positioning components are bolted to precisely milled surfaces on a single main base casting. Its servo system has a stiffness of 10 pounds per mil. The temperature specification is tough: 50°F to 104°F. It's those kinds of features

which are your guarantee that data written on one 7900 can be read on another. With complete reliability.

And it's the kind of performance value you expect of Hewlett-Packard peripherals. We built it into our 7900 disc drive. You'll find it in our family of 7970 tape units, too.

For instance, there's our new 1600 CPI 7970E Digital Magnetic Tape Unit with speeds of up to 45 ips. It has built-in value features like phase encoded data electronics, including error correction and detection circuitry. All in a compact 24-inch high transport.

Trouble-free performance is assured by eliminating all mechanical adjustments. Gentle tape handling is provided by simplified tension arm buffering and electro-dynamic braking.

The 7970 family offers over 200 standard and special configurations. And

you can get them to handle virtually any format around: ANSI/ECMA, phase encoded, NRZI and multiformat, phase encoded/NRZI. But that's only part of our story.

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# COMPUTER industry

a Computerworld news section about the nation's fastest growing industry

March 8, 1972

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## CI Notes

### Explosion Hits IBM Office

CAMBRIDGE, Mass. — An IBM sales office here sustained "relatively minor" damage last week following an explosion and fire believed by police to have been caused by a pipe bomb.

There was no internal structural damage to the three-story building which did not contain any DP equipment.

A passerby asked, "Why do they always pick on IBM?" She added that the firm had put in Plexiglass windows following other incidents of broken windows.

### ICL Government Aid Expected

LONDON — Talks between the British Government and International Computers Ltd. are making "satisfactory progress" and should be "concluded shortly," Sir John Wall told the ICL annual meeting before stepping down as chairman [CW, March 1].

Wall indicated that ICL has "emphasized the vital importance to the British computer industry of substantial government orders for computer systems."

"The direct placing of orders for larger systems must remain an essential part of government policy for some time to come," he added.

### DEC Reduces PDP-8/M Price

MAYNARD, Mass. — Digital Equipment Corp. has reduced the price of its PDP-8/M minicomputer from \$4,095 to \$3,990.

"With this price reduction, an OEM can purchase a PDP-8/M with 4K words of core memory, teletypewriter interface and programmer's console for less than \$2,500 in quantities of 100," said Wayne E. Furman, marketing manager for the product.

### Supershorts

Itel Corp. will furnish its 3330/3830 type disk drive subsystems to Storage Technology Corp. on an OEM basis. The expected value of this contract could be up to \$30 million over four years, although at the present time the commitment is for only a portion of this amount.

National BankAmericard Inc. has rejected all of the proposals submitted last November for an existing system for bank card authorization which would expedite approval of cardholder purchases on a nationwide basis. The system required would service 75 BankAmericard service centers throughout the U.S. which communicate in various ways including telephone and Telex.

Memorex Corp. has awarded a contract to Memory Technology, Inc. for over 100 Read-only memory systems to provide control storage for Memorex's 660 Disk Controller.

Takachiho Koheki, Co. has been appointed the exclusive end-user market distributor of Calcomp IBM-compatible disk drive memory systems in Japan, Korea, Okinawa and Taiwan.

Lockheed Electronics MM-365 Memory System has been assigned a Federal Supply Schedule contract by the General Services Administration.

## Production, Software Delays

# Soviets. Developing 'Third Generation'

By Frank Piasta  
Of the CW Staff

MOSCOW — Slipped delivery schedules for computer hardware and software are not exclusive to the U.S., judging from information recently made public by the Soviet Union.

Scarcity of programmers and high quality components have been cited by *Pravda*, the Communist Party newspaper, for delays in the production of the United Systems (EC) 1020, the first Soviet "third-generation" system.

The programmers, who are being recruited from Soviet mathematicians, seem to prefer working for the using agencies, which pay higher salaries, than for the design institutes, *Pravda* said.

Component prices, fixed by the government, are said to provide little inducement for the production of high quality components. Parts in short supply range from special wiring to computer peripherals and core memories, according to the newspaper.

The EC 1020, currently in the prototype stage, bears a striking resemblance to the seven-year-old IBM 360/30, based on specifications supplied by the State Committee of USSR Council of Ministers for Science and Technology.

The Soviet computer, first of a planned seven models, has a cycle time of 2  $\mu$ sec/byte and an access time of 1  $\mu$ sec. Fixed point add/subtract time is 20- to 30  $\mu$ sec. A fixed point add on the 360/30 takes 30  $\mu$ sec.

Main memory size of the EC 1020, with a range of from 64K to 256K bytes, is considerably larger than that available with the 360/30, 8K to 64K, resembling more the 64K to 512K range of the 360/50. Memory protect for both data and software is included.

The EC 1020 is equipped with a multiplexer channel with from 48 to 128

subchannels and a total throughput rate of 12 kbyte/sec. Two selector channels with a data rate of 200 kbyte/sec can be attached.

Peripherals include magnetic disks, magnetic tape, card reader and punch, paper tape reader and punch, line printer and operator console with a keyboard printer.

The EC 5052 disk drive uses disk packs and resembles the IBM 2311. Using packs with six disks and 10 recording surfaces, the drives have a capacity of 7.25 Mbytes, recorded on 200 track/surface. Three spare tracks are provided. Average access time is 60 msec.

The EC 5012 magnetic tape drives, recording 9-track NRZI data on half-inch tape, are capable of densities of 813 or 203 bit/in. at 79 in./sec. Start/stop time is 4.5 msec. Data transfer rate is 64 kbyte/sec.

The EC 6012 card reader uses a photoelectric mechanism to read 500 card/min. Cards are punched by the EC 7010 at 100 card/min.

### OS Bootstrap

Software information provided is sketchy, but indicates that an operating system is used to bootstrap the system, handle interrupts, provide a program library, control channel operations and allow an unspecified level of multiprogramming.

The United Systems includes six other processors. The 1010 is designed to be used as a satellite to the larger models and thus has a more restricted instruction set. The standard 8K memory can be expanded to unspecified limits.

The next more powerful system, the 1021, has a main memory capacity of from 16K to 256K, smaller than the 1020, but execution time is up to 20 times as fast as the 1020. Compatibility with the larger processors is limited by its need for a special set of instructions for command control.

The models 1030, 1040, 1050 and 1060 are fully program-compatible with each other.

Memory capacities also cover a broad range with the 1030 from 128K to 512K bytes, the 1040 and 1050 from 128K to 1,024K bytes, and the 1060, 256K to 2,048K bytes.

## Digital Computer Controls Aims At 'Second Source' Mini Market

By E. Drake Lundell Jr.  
Of the CW Staff

FAIRFIELD, N.J. — Digital Computer Controls decided to produce Digital Equipment- and Data General-compatible minicomputers because many systems are "locked" into those machines, according to John N. Ackley, president of the firm here.

"The computer is just a component of the system," he said, and many mini makers have not produced minis that could fit into the majority of the available systems which are tied into DEC and Data General.

Even though the computer is being increasingly recognized and used as just a component in complete systems, Ackley said, "there has never been a competitive second source in the computer industry like there is in the components business. 'We decided to be that second source,'" he added.

The move hasn't been free of trouble, however. Data General has sued Digital Computer Controls charging it used Data General trade secrets in the design of its D-116 machine which is a compatible replacement for the Nova 1200.

While Data General has taken DCC to court over the issue, DEC has not taken any action against the firm to date.

Ackley admits that the DCC machines are completely hardware and software compatible with the DEC and Data General machines — in fact they even run the same programs — but said that the DCC computers used improved technology over the machines that they are modeled after.

Presently, Digital Computer is shipping at a "very high rate," Ackley said, claiming "we're number three in the mini business in terms of shipping rates."

And the business is extremely profitable. According to Ackley, "We're making a 31% pretax profit on sales."

While the business has been extremely profitable, "we have not seen other firms moving into this area," he said.

"We do expect to see more in the future, however," he added.

In the future, he said, Digital Computer will offer a wider line of equipment — a

complete line of compatible hardware across the board.

While many other firms have found the OEM business dropping over the past few years, Ackley said, "we still find the OEM business an extremely good market to be in."

In fact, almost 100% of the firm's business is presently divided between systems houses and other equipment manufacturers, the traditional OEM markets.

At the same time, though, Digital Computer Controls is going after the end-user market "cautiously," concentrating its attention on the sophisticated end-user in special market areas.

Even though many industry observers have said there will be a large shakeout in the minicomputer business, Ackley disagrees.

"The market is growing too fast for there to be a major shakeout or reduction in the total number of firms in the marketplace," he said.

## Viatron Unwraps 2113 Terminal

BEDFORD, Mass. — Viatron has sparked its comeback from the depths of its Chapter 10 financial woes with the announcement of a new version of its System 21 Data Entry Terminal.

The new version of the terminal, the 2113, provides an arithmetic capability for data entry applications that require addition or subtraction in a manual or batch mode.

Shipments of the new version, priced at \$4,960, will be made this week, Dockser said. Existing 2111 systems can be field upgraded in one day to include the new capability, Viatron said. The units will be modified and serviced by Control Data Corp.

The 2113 differs from the 2111 because of a new hardwired microprocessor and three keyboard changes to allow addition, subtraction, total accumulation and total output.

As demonstrated last week, the 2113 can perform its calculations in either a

manual or automatic mode. The system can accumulate totals for a maximum of 40 fields up to 79 digits each.

Domestic and foreign sales figures of \$783,000 for the period of May 8 to Nov. 20, 1972, were also revealed by Robert Dockser, Viatron president, representing an average shipping rate of about 30 system/mo.

Shipments are being made from inventory, Dockser said, at a somewhat lower rate for the last two months, with all sales on a purchase basis. Current inventory is valued at about \$5 million, representing about 1,000 systems. Assets are pegged at \$7 million.

Product reliability has been improved, Dockser said. The average number of service calls per system has dropped to four a year due to engineering improvements made in the terminals. "Reliability has improved tremendously in the last six months," a large user said.



## ICL Number One in East Africa; Strong Trend to Africanization

By Bohdan O. Szuprowicz  
Special to Computerworld

NAIROBI, Kenya — East Africa, which consists of Kenya, Uganda, Tanzania, Ethiopia, Zambia and the Sudan, is probably the only area in the free world where IBM does not lead in number of installed computer equipment.

Of a total of 37 installations in those countries 23 are ICL machines, or 62% of the market.

Among the six countries Kenya is by far the most computerized nation with 20 of all the installations concentrated mostly in Nairobi. Tanzania and Zambia have six installations each, Ethiopia has four computers and Uganda three — one will soon be installed in the Sudan.

The reason for strong ICL representation in East Africa goes back to colonial days when under British rule ICL, then known as ICT Ltd., already was well established as a supplier of tabulating and unit record equipment to the administrative bodies of the region. ICL was quick to exploit the market and today most of the government installations are ICL.

IBM leads in Ethiopia and Zambia and has most of its machines installed within the commercial segment. Many of the decisions to install an IBM machine in such situations have not actually been made locally but in respective corporate headquarters in the U.S.

Besides ICL and IBM the only other manufacturer with computer installations is Burroughs. It operates a service bureau in Nairobi using a Burroughs 3500 and has also one installed at Ethiopian Airlines.

### Africanization

Perhaps the one dominant characteristic of the East African computer industry is the trend to Africanization of operations at all levels. Management jobs are still in the hands of Europeans because they are the only people with any experience in computer skills. But most of the British and Americans are well aware that their job is to train an African as soon as it becomes reasonable for the company to do so.

At the keypunch operator and programming level Africanization is progressing rapidly. This results in promotion of many African programmers with relatively limited experience to responsible and senior positions.

### IBM's Role

The manufacturers must also provide systems engineering and computer engineering support for their installations. Unbundling has not yet arrived, although IBM announced its new business practices

pertaining to new equipment, such as System 3 and 370 Series. Otherwise IBM provides free education and will not unbundle fully until June 1973. Local IBM managers have the authority to propose various deals such as free conversion or system design not normally offered by the company.

Many computer users claim to depend on their own resources as far as systems engineering is concerned. They admit quickly that IBM is superior when it comes to customer engineering support and the impression here is that IBM 360 equipment is perhaps of sounder mechanical design.

There is some feeling that East Africa is reaching a saturation point as far as new installations are concerned. While some upgrading of existing systems may take place and peripherals added, few new installations are expected.

## CTC to Appeal Export License Denial

CHERRY HILL, N.J. — Computer Test Corp. (CTC) plans to appeal a U.S. Department of Commerce denial of a license application to export core memory testing equipment valued at about \$250,000 to a firm in Hungary, the Videoton Radio and Telesivisor Works.

The Commerce Department's denial of the license application stated that the U.S. and the Cocom countries (the Nato nations except Iceland but including Japan) consider export of that type of equipment to be "detrimental to our national security."

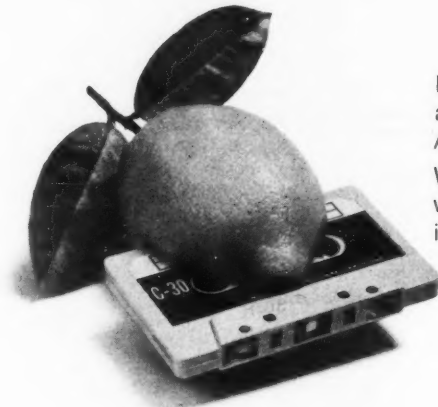
"We feel that the denial is an arbitrary decision made by officials of the Department of Commerce which is contradictory to the stated policies and objectives of the Nixon Administration," said CTC General Manager Arthur Johnston.

The administration allows other firms within the computer industry, such as IBM World Trade and International Computers Ltd., to "sell substantially more sophisticated electronics equipment to the USSR and to Eastern European countries," Johnston said.

"This raises questions in our minds about why the end product can be sold, but not the test equipment needed to produce computers similar to those exported by IBM and ICL," he added.

"As a result, markets for U.S. products cannot be tapped because of arbitrary export policies. Also, these countries gain technologically by developing, in this instance, their own testing equipment, thereby bridging this important gap and narrowing our technological lead," Johnston noted.

# Two Years Ago, Almost



Including us. A digital cassette recorder. Seemed like a great idea at the time. But there was too much garbled info. And lousy reliability. A bumper crop of real lemons.

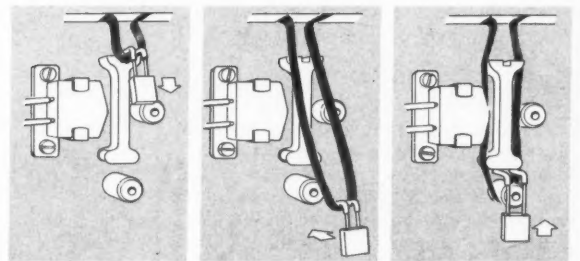
Well, we licked our wounds along with everyone else. But we also went back to the drawing board because we still thought the basic idea was sound. And we came up with a unit that really works.

## A Whole New Concept

To get super reliability, we reasoned, you have to control that tape. So, we started from scratch. Got rid of the traditional pinch rollers, belts, solenoids, levers and mechanical linkages from the transport. Took out the head guide forks.

Eliminated the need for pressure pads. Those were the main cause of head and tape wear, oxide shed and dropout.

Then, instead of just pushing the head up to the tape as it rolls by, we decided to get the tape out of the cassette. (That way the cassette is just a tape holder.) So we designed two little fingers that pull the tape down past the head, over a precision guide and around a capstan. That maintains optimum head wrap angle — critical for read-after-write operation. And it's all done automatically as you load. (We've got a patent pending, in case you're interested.)



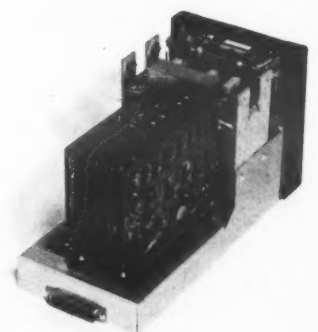
## The Insides

Next, we put in three DC motors. One for the capstan and one for each reel. Servos positively control tape tension on both sides of the capstan. And tension sensors confirm proper loading to BOT — no writing on tape leader. There's no drag on the tape. Ever.

So now we have high bi-directional tape speed, fast start/stop times, precise start/stop distances.

Reel motor torque is automatically reduced when EOT or BOT is sensed to prevent pulling tape from cassette reel hubs or other possible tape damage.

All modular electronics. Plug in PC boards. Logic and interface that're TTL compatible.



## Fujitsu Plans Entry Into Australian DP

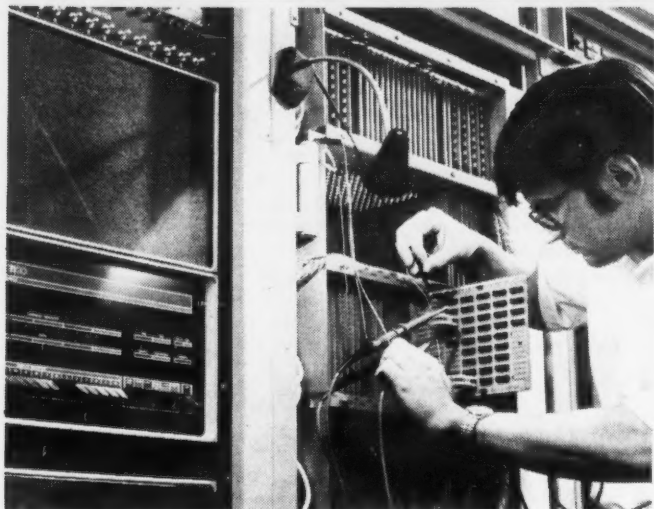
Special to Computerworld

SYDNEY, Australia — Fujitsu Ltd. is turning its attention to the Australian market as part of its announced plan to rival IBM in terms of the international computer market.

Fujitsu plans to enter a joint venture with an Australian company, probably an established software house, and is also planning to set up a direct marketing and service operation within Australia, the first by a Japanese firm, it said.

Marketing of Fujitsu's Facom equipment will be handled by Nissho-Iwai Co. Pty. Ltd., and plans call for a data center to be set up by the end of this month, according to President Y. Kohra.

"Although there is a time lag of about 15 years between IBM and Fujitsu, Fujitsu has developed faster than IBM," Kohra said. "The difference between the two could be overcome within the next 10 years because of Fujitsu's faster tempo of development."



## Engineers' Choice

Goodyear Aerospace Corp.'s Staran computer, undergoing a memory unit test here, has been named one of the "10 outstanding engineering achievements of 1971" by the National Society of Professional Engineers.

## MAI Has Big Plans

# Bright Future Seen for Basic/4

By E. Drake Lundell Jr.

Of the CW Staff

NEW YORK — Although the firm will never get away from its beginnings in unit record equipment, marketing of the Basic/4 computer system will be the largest segment of the revenues of Genesis One Computer Corp. by 1975, according to Myron Angier, president of the MAI unit.

Genesis One was formed as the marketing arm of MAI under a revitalization program that split the company four ways: Sorbus for maintenance service; Basic/4 as a manufacturer; Genesis One for marketing; and MAI International for overseas operations.

Presently, unit record equipment accounts for around 80% of the business of Genesis One, Angier said, but revenues from unit record equipment are declining and will account for a smaller and smaller percentage of the firm's revenues over the next few years.

But while the revenues are declining, they are not falling as rapidly as originally predicted, Angier

said. "Last year the revenues from unit record equipment exceeded our forecasts," he stated.

### Great Expectations

To take up the slack for the decline in unit record revenues, the firm expects the Basic/4 to be the largest revenue producer within five years, but has not stopped there.

"We're constantly searching for new products and services," Angier said, indicating other products could come in connection with the Basic/4. Potential areas include tape and disk drives, he said.

The firm would consider taking over or merging other companies into its operation to get the necessary product lines, he said, indicating "no avenues of expansion have been closed."

But, primarily, the firm will act as an adviser to manufacturers, marketing and maintaining their products on a contract basis, Angier indicated.

The present marketing for the Basic/4 is aimed at the small businessman, Angier said, in direct competition with IBM's System 3.

In fact, over 50% of the orders received for the Basic/4 in the Southern California area, where it has been marketed the longest, have been to replace System 3 installations, he claimed.

To be successful with the small businessman, a company has to offer a product that can be tailored to his needs, Angier said, indicating some of the systems on the market were too powerful for the market.

At the same time, the product has to be produced and sold at a price low enough for the small businessman to be able to purchase it outright, since the market is primarily a purchase market, Angier stated.

The system also has to be expandable, he said, since the small user often wants to start with a minimum of applications and later expand to more sophisticated uses — without having to get a whole new system.

The manufacturer entering this market also has to be familiar with the small user's business and business practices so that it can tailor specific application packages to those needs.

The small business market is an applications-oriented environment, he said, and a manufacturer has to be able to not only offer applications packages, but also applications support from local offices.

With this type of support, a firm can offer generalized applications packages that can then be tailored to particular users and particular regions of the country by on-site or local systems engineers.

Maintenance availability is also an important part of making a sale to the small user, Angier said. A firm has to be able to guarantee it can maintain the equipment quickly and efficiently, he said.

While the initial sale is obviously important in the small business market, the quality of the service is also important because "add-on business is a significant factor in the market," according to Angier.

### MAI Problems

Before its reorganization and "revitalization" MAI ran into trouble because it overstated the useful life of unit record equipment, according to Angier. But while the recession hit most of the industry in 1970, the low point for MAI came in 1969, he said.

"The downturn in the use of unit record equipment came earlier than we had expected," he said, adding, "we are being more conservative in our estimates now."

"I don't think we — or the industry — will ever get away from punched cards or the need for unit record equipment, but its use is definitely declining," he said.

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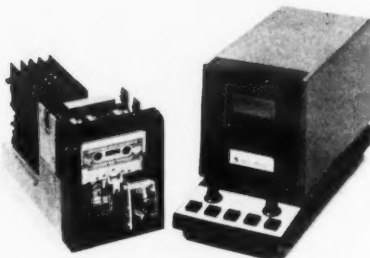
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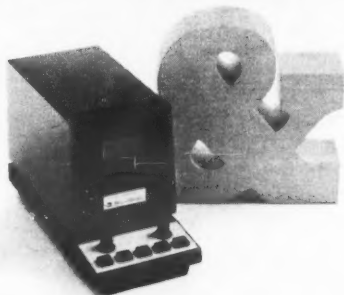
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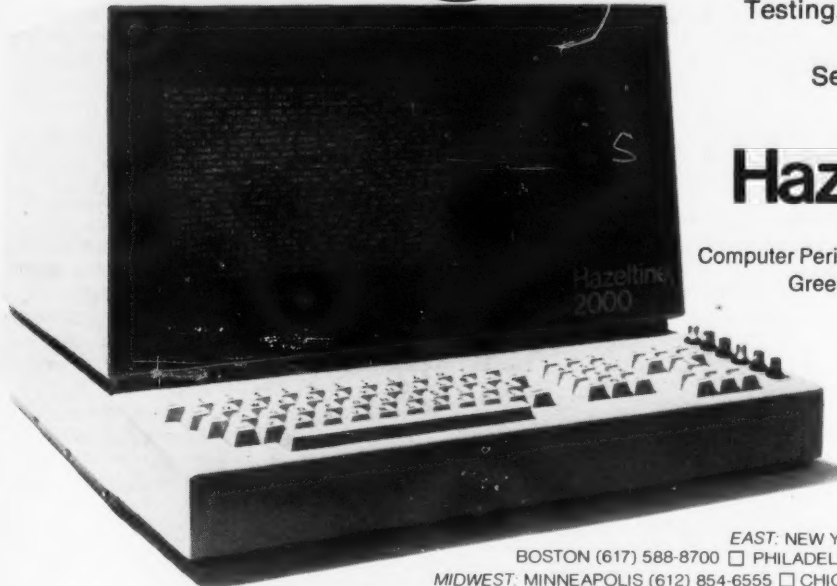


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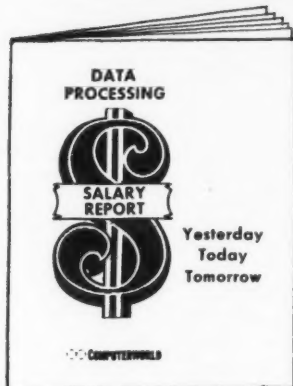
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## CRT Displays in Stereo

LONDON — A system that generates stereo images of computer graphics on a CRT is being offered both for direct sale to customers and for licensing to U.S. manufacturers by the British National Research Development Corp.

The stereo display system employs a split-screen transmission/reflection technique with a viewing device attached to a CRT. Two pictures are optically superimposed by a semi-reflecting mirror and routed to the eyes by polarizing filters. One picture is seen through the mirror; the other, initially inverted, is reflected from it.

In computer graphics, a software package is used to generate and manipulate the stereo pairs.

Complete systems or licensing data are available from 66-74 Victoria St., London SW1E 6SL, England.

### HP 2570A Stand-Alone

PALO ALTO, Calif. — Hewlett-Packard has extended the capabilities of its 2570A Coupler/Controller to include stand-alone data acquisition and storage under time-paced control by offering clock/timer/pacer and magnetic tape interface options.

The incremental magnetic tape interface provides the coupler/controller with high-speed (500 char./sec) data storage for both data acquisition systems and distributed computer/terminal systems.

The 12812A incremental magnetic tape interface comes in both read-write and write-only versions and operates with most Kennedy 1600 and 1610 series recorders, HP said. Prices start at \$1,400 without recorder and deliveries begin in April.

The 12811A clock/timer/pacer is priced at \$1,250 without options. Deliveries are from stock.

### Other New Products

The PR-2060 combination paper tape punch and reader with fan-fold paper handling from Data Specialties, Highland Park, Ill., is shock mounted inside a heavy duty enclosure to insure reliable operation under severe factory conditions.

The JH-05 computer/plotter interface from Minuskin Assoc., Tustin, Calif., provides timing storage and transfer of graphic data from Honeywell DDP 516/416/316 computers to most incremental plotters.

A PC-board disk-memory controller that slides into the Nova series of minis was announced by Information Data Systems.

A keyboard entry memory programmer from Spectrum Dynamics, Fort Lauderdale, Fla., offers a programming speed of

160  $\mu$ sec plus the number of bits programmed times the specified time/bit. Words can be verified or blanks can be checked at 100 kHz/word. Data capability can be expanded from 9 bits. Address capacity is expandable from 9,999 to 99,999 words.

The Instrument Systems Division of Gould, Inc. has announced an 8-channel general-purpose recorder with built-in amplifiers. The Brush 481 has a measurement range from 1 mV to 500 V full scale. Features include pressurized ink writing, rectilinear trace presentation, 99.5% linearity, 40 Hz response at 50 divisions and electronic signal limiters.

### New OEM Products

The Tape Tensiometer from International Technical Industries, Santa Cruz, Calif., measures tape tension from 1- to 100 grams with one gram resolution and response time under one msec, without deflecting true tape path.

A high-speed moderate resolution D/A converter containing, within a single package, all elements including input buffer logic, electronic switches, ladder network and voltage reference sources, is available from Datal Systems, Canton, Mass.

## Computerworld Sales Offices

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## NCR Cancels \$8 Million Data Products Contract

WOODLAND HILLS, Calif. — Data Products Corp. appears to be the first OEM casualty of the recently announced plan of Control Data Corp. and NCR to jointly develop peripheral equipment.

The firm last week announced NCR had cancelled an \$8 million contract for print hammer components, that were to be used in its C648 printer program.

Since the Control Data-NCR deal, the program has apparently been scrapped in favor of a jointly developed printer or a Control Data model.

The contract was issued to Data Products in 1971 and covered a multi-year period with initial shipments beginning in January of 1972.

Graham Tyson, president of Data Products, stated: "Since

the order as scheduled for delivery by NCR called for limited quantities in the first year, the NCR action will not adversely affect current operating results, nor will it have significant impact on our next fiscal year, which begins March 26, 1972.

"The contract includes termination clauses under which Data Products will be reimbursed for its start-up and other costs and expenses.

"Of course, we are not pleased to lose any contract. However, as a supplier to data processing equipment manufacturers, we are accustomed to program changes and accompanying contract accelerations and decelerations. In general, the incoming new order rate has been steady and the backlog of orders on hand is in the range of \$30 million," Tyson said.

## Honeywell Lands Viking Contract

ST. PETERSBURG, Fla. — Honeywell's Aerospace Division here has won a \$6.3 million contract to build the Guidance Control and Sequencing Computer for the Viking Mars lander program.

Honeywell received the award

### Contracts

from Martin-Marietta, builder of the Mars lander under contract with Nasa's Langley Research Center.

The computer will direct the descent and landing of the capsule to the surface of Mars, in the Viking program that is scheduled for launch from Cape Kennedy in 1975, with landing set for the summer of 1976.

#### Other Contracts

Boeing Computer Services Inc. will add further capabilities to

the Advance Penetration Model computer program under a new \$250,000 contract from the Air Force.

Delta Data Systems Corp. has received a contract from the state of Pennsylvania under which all state agencies may lease or purchase CRT terminals from Delta. The state estimated that terminal requirements under the contract during the next five years will amount to 2,400 terminals with a value of over \$6 million.

TRW Inc. is conducting a study of air traffic control methods for Nasa. The study will analyze communications, laws, aircraft and crew performance and relate this information to accuracy of aircraft position determination, separation distances, and how often position determinations must be made.

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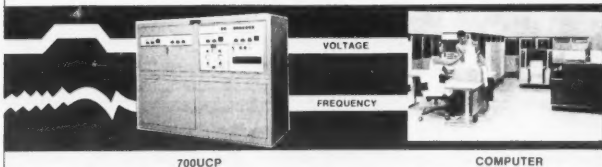
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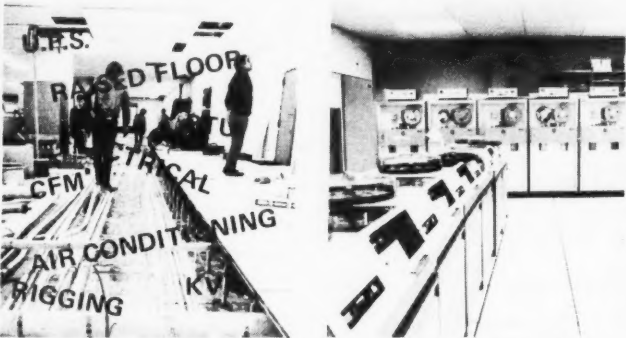
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## Prospective Partners Report

# CDC's Earnings Soar, NCR's Plummet

MINNEAPOLIS — Two prospective partners have posted markedly different earnings pictures for 1971, but in each case the DP segments show improvement.

Control Data Corp.'s earnings totaled \$35.8 million, compared to last year's loss of \$3.2 million, while National Cash Register's earnings plummeted to \$1.3 million from last year's \$30.2 million.

CDC and NCR have announced plans to develop a compatible line of mainframes and to form a third unit for the manufacture of peripherals [CW, Feb. 2].

CDC's gains were bolstered considerably by its Commercial Credit Co. subsidiary. Losses from computer operations were cut from last year's \$36.9 million to almost \$10 million, and the company expects computer operations to be "modestly profitable" in 1972, according to Marvin G. Rogers, financial vice-

president.

However, "it's doubtful whether computer operations will be profitable in the 1972 first quarter," he added.

Before a special credit of \$72,801, year-end earnings were \$35.7 million, or \$2.37 a share, compared with an operating loss of \$4 million in 1970. A special credit of \$819,738 reduced the final 1970 loss to \$3.2 million. Revenues rose to \$571.2 million from \$539.5 million a year earlier.

CDC's holdings in Commercial Credit's earnings increased to \$50.3 million from \$38.2 million in 1970.

The depreciable life of certain computer systems and related equipment has been extended from four to five or six years, CDC said, which added about \$7.9 million, or 55 cents a share to the 1971 net.

NCR's revenues for the year rose to \$1.47 billion, up from

\$1.42 billion in 1970, but earnings were only \$1.3 million or 4 cents a share compared with last year's \$30.2 million or \$1.37 a share.

Consolidated incoming orders for DP equipment were up 40% over last year, and computer shipments were near the record 1970 level, according to the firm.

### Revenue Falls

In the final quarter, revenue fell to \$400.6 million from \$420.9 million a year earlier. The period's loss of \$15.7 million reflected the 16-week strike at the Dayton, Ohio, plant and year-end writeoffs totaling \$17 million, the firm said.

The strike resulted in an estimated \$10 million after-tax adverse impact on 1971 earnings, NCR said.

Year-end writeoffs were taken for parts inventories of older projects scheduled to be replaced and heavy costs relating to the reengineering and modification of certain products, NCR said.

The directors voted to reduce the quarterly dividend from 18 cents to 10 cents in view of the "unsatisfactory results for 1971 and the continuing significant impact which the Dayton strike is expected to have on 1972 earnings."

## Memorex Shows \$13.4 Million Loss

SANTA CLARA, Calif. — Memorex reported a drastic turn in its earnings picture, with a \$13.4 million loss compared with last year's earnings of \$3.2 million, or 83 cents a share.

"Poor" sales of tape products, economic conditions and price competition in disk storage rental rates were blamed for the downturn.

Revenue totaled \$110.2 million, up from almost \$79 million in 1970, but was "less than planned," according to President Laurence L. Spitters.

The firm's computer equipment leasing revenue expanded from \$9.1 million in 1970 to \$45.6 million in 1971. Also in the year, about two-thirds of Memorex's total manufactured peripheral equipment was marketed under leases.

"In 1972, this predominance of our leasing operations is expected to increase," Spitters said. However, he added, "the cost-conscious market environment" in 1971 inhibited the "diversification of our lease base."

## Nickels & Dimes

**Calcomp's** 22% rise in earnings and 29% increase in revenues for the six months ended Jan. 2 was attributed by President Lester Kilpatrick "principally to growth of lease income from IBM compatible disk drive memory systems."

\$\$\$

What a way to start. **Futronics** declared its first dividend of 100% payable Feb. 24 to stockholders of record Feb. 10.

\$\$\$

**Computer Terminal**, maker of Datapoint terminals, has obtained \$1.5 million in financing, with the placing of a \$1 million subordinated debt with a group of its major investors and \$500,000 financing from the Frost National Bank of San Antonio.

\$\$\$

**Com-Share** is chewing into its outstanding debentures. When current exchange agreements are completed, the time-sharing firm will have outstanding a principal balance of \$799,000 out of an original \$2 million senior debenture.

**Computer Machinery Corp.** had a record year, with orders up over 70% from 1970 to \$33.9 million and deliveries rising over 90%, to \$26.8 million.

\$\$\$

**Diebold Computer Leasing's** per share earnings for the year ended Dec. 31 registered a 100% increase, from \$1.9 million or 48 cents a share to \$3.3 million or 96 cents a share. All this on a \$3.4 million revenue climb, from \$33.5 million to \$36.8 million.

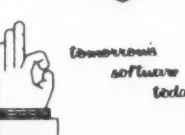
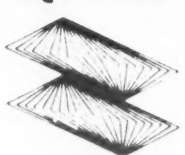
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Names in lights on Nasdaq, the automated over-the-counter quotation system: **Com-Share**, as CSHE, and **Redactron**, as Rdac, maker of editing typewriters and peripherals.

\$\$\$

**Rapidata** showed a turnaround for the year ended Dec. 31, with earnings of \$567,644 or 67 cents per share compared with a loss of \$144,582 or 18 cents per share in 1970. Revenues climbed to \$5.4 million from \$4.4 million last year.

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# Computerworld Stock Trading Summary

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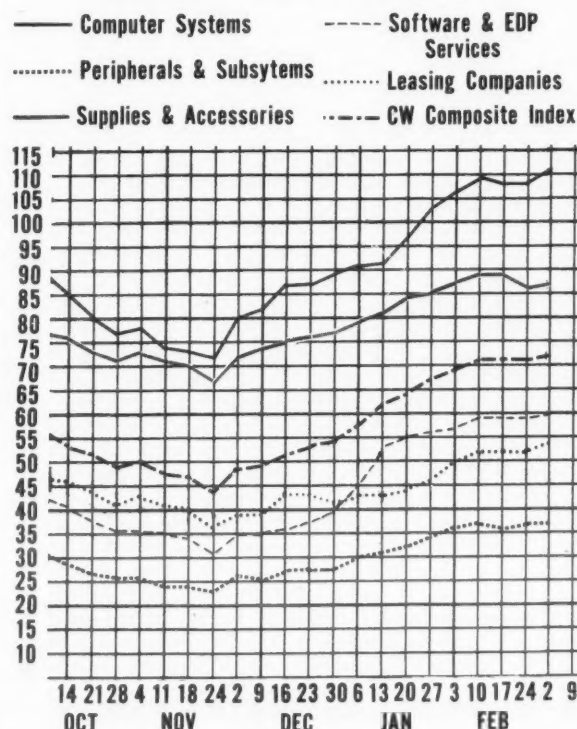
CLOSING PRICES THURSDAY, MARCH 2, 1972

E X C H	71-72 RANGE (1)	CLOSE MAR 2 1972	WEEK NET CHNGE	WEEK PCT CHNGE
<b>SOFTWARE &amp; EDP SERVICES</b>				
O ADVANCED COMP TECH	1- 4	1 7/8	+ 1/8	+7.1
A APPLIED DATA RES.	5- 13	6 1/4	+ 1/8	+2.0
O APPLIED LOGIC	1- 3	2 1/4	0	0.0
N AUTOMATIC DATA PROC	44- 86	86 1/4	+3 3/8	+4.0
O AUTO SCIENCES	1- 8	5/8	0	0.0
O COMPUTER DIMENSIONS	9- 17	12 3/4	-1 1/4	-8.9
O COMPUTER NETWORK	2- 11	5	0	0.0
N COMPUTER SCIENCES	6- 17	8 1/2	+ 3/8	+4.6
O COMPUTER TECHNOLOGY	4- 11	5 7/8	- 1/8	-2.1
O COMPUTER USAGE	5- 16	10 3/4	+1 1/2	+21.1
O COMP AUTOMOT REPORTS	6- 13	7	- 1/4	-3.4
N COMPUTING & SOFTWARE	17- 45	23 1/2	+ 3/4	+3.2
O COMRESS	1- 4	2 1/8	- 3/8	-15.0
O COMSHARE	4- 9	7 1/2	- 1/4	-3.2
O DATA AUTOMATION	1- 4	1/8	0	0.0
O DATA PACKAGING	6- 10	9	+ 3/4	+9.0
O DATAMATION SERVICE	1- 3	1	0	0.0
L DATATAB	3- 8	7 1/4	+ 1/4	+3.5
O EDP RESOURCES	5- 16	5 1/2	0	0.0
A ELECT COMP PROG	2- 7	4 1/4	+1 1/4	+41.6
N ELECTRONIC DATA SYS.	34- 85	53	-3	-5.3
O INFORMATICS	6- 15	9 5/8	- 1/4	-2.5
O I.O.A. DATA CORP	1- 3	1 1/2	+ 1/2	+50.0
A ITEL	7- 23	11 3/4	+1 1/2	+14.6
O KEANE ASSOCIATES	4- 14	4 1/2	- 1/4	-5.2
O KEYDATA CORP	5- 14	10 1/4	+1 1/2	+17.1
O LOGICON	5- 8	7 3/4	- 5/8	-7.4
A MANAGEMENT DATA	5- 11	8 3/8	+ 3/8	+4.6
O NATIONAL CSS INC	7- 14	11 3/4	- 1/4	-2.0
O NAT COMP ANALYSTS	1- 4	3/4	- 1/8	-14.2
P ON LINE SYSTEMS INC	7- 18	12	-2 3/8	-16.5
N PLANNING RESEARCH	10- 26	15	+ 3/4	+5.2
O PROGRAMMING METHODS	16- 29	23 1/2	+ 1/8	+0.5
O PROGRAMMING & SYS	1- 4	1 3/4	0	0.0
O SCIENTIFIC COMPUTERS	2- 4	3 1/4	0	0.0
O SIMPLICITY COMPUTER	1- 4	3 1/8	+ 1/4	+8.6
O SOFTWARE SYSTEMS	1- 3	1 3/8	0	0.0
O TBS COMPUTER CENTERS	4- 9	4 7/8	- 1/4	-4.8
O TOLLEY INTL CORP	3- 8	11 1/8	- 7/8	-7.2
O TRACOR COMPUTING	2- 5	1 7/8	- 1/8	-6.2
O TYMSHARE INC	4- 15	7 3/4	-1 1/4	-13.8
O UNITED DATA CENTER	2- 8	6 3/4	- 1/4	-3.5
N UNIVERSITY COMPUTING	14- 38	19 1/2	0	0.0
A URS SYSTEMS	5- 11	8 1/4	+ 3/4	+10.0
O VORTEX CORP	2- 6	5 1/4	+ 3/4	+16.6
<b>PERIPHERALS &amp; SUBSYSTEMS</b>				
N ADDRESSOGRAPH-MULT	24- 48	42	+4 1/4	+11.2
O ALPHANUMERIC	1- 6	1 1/4	0	0.0
N AMPEX CORP	8- 25	9	- 1/2	-5.2
O ANDERSON JACOBSON	5- 10	7	+ 3/8	+5.6
O ATLANTIC TECHNOLOGY	3- 9	8 1/2	- 1/4	-2.8
A BOLT, BERANEK & NEW	4- 9	8	0	0.0
N BUNKER-RAMO	6- 17	10 5/8	+1 1/8	+11.8
A CALCOMP	14- 33	23 5/8	+1 3/8	+6.1
O COGNITRONICS	2- 9	3 5/8	- 1/4	-6.4
O COMPUTER COMMUN.	5- 19	6 1/8	+ 1/2	+8.8
A COMPUTER EQUIPMENT	3- 7	3 7/8	- 1/4	-6.0
A COMPUTEST	4- 20	4	- 5/8	-7.4
O CONSOL COMPUTER LTD.	1- 12	1/2	- 1/8	-20.0
A DATA PRODUCTS CORP	3- 10	5 5/8	- 1/4	-4.2
O DATA RECOGNITION	3- 8	4 1/2	0	0.0
O DATA TECHNOLOGY	3- 9	3 3/4	- 1/8	-3.2
O DI/AN CONTROLS	3- 7	4 3/4	- 1/8	-2.5
O DIGITRONICS	2- 8	2 7/8	0	0.0
N ELECTRONIC M & M	5- 16	6 7/8	+ 1/4	+3.7
O FABRI-TEK	2- 4	3 5/8	- 1/2	-12.1
O GENERAL COMPUTER SYS	6- 16	14 1/2	- 1/2	-3.3
N GENERAL ELECTRIC	53-124	61 5/8	+2 7/8	+4.8
N HAZELTINE CORP	6- 13	12	+ 3/8	+3.2
O INFOTEX INC	17- 49	38	+ 1/2	+1.3
O INFORMATION DISPLAYS	3- 8	3 1/2	0	0.0
O MANAGEMENT ASSIST	1- 2	1	0	0.0
A MARSHALL INDUSTRIES	7- 27	11	- 1/2	-4.3
N MEMOREX	20- 78	28	-4 1/2	-13.8
A MILGO ELECTRONICS	12- 31	30 1/2	+1 1/2	+5.1
N MOHAWK DATA SCI	15- 47	21 3/8	+1 7/8	+9.6
O OPTICAL SCANNING	6- 18	12	-1 1/2	-11.1
O PERTEC CORP	9- 18	15 1/4	+ 5/8	+4.2
O PHOTON	6- 15	14	- 1/8	-0.8
A POTTER INSTRUMENT	11- 25	18 1/2	+ 1/4	+1.3
O PRECISION INST.	7- 16	9 1/2	+ 1/4	+2.7
O RECOGNITION EQUIP	9- 26	12 3/4	- 1/2	-3.7
O REDCOR CORP.	1- 9	7 3/4	+ 1/8	+50.0
N SANDERS ASSOCIATES	9- 22	18 1/2	+ 1/8	+0.6
O SCAN DATA	6- 15	13 1/4	+1 1/8	+9.2
O SYCOR INC	3- 11	8 1/2	-1 1/4	-12.8
O TALLY CORP.	6- 16	9 5/8	- 1/2	-4.9
N TEKTRONIX INC	28- 44	41 3/4	+6 1/4	+17.6
N TELEX	8- 22	12 3/8	+ 5/8	+5.3
<b>SUPPLIES &amp; ACCESSORIES</b>				
N ADAMS-MILLIS CORP	9- 19	12 3/4	+ 1/4	+2.0
O BALTIMORE BUS FORMS	6- 10	7 3/4	0	0.0
A BARRY WRIGHT	7- 13	12 1/8	- 1/8	-1.0
A DATA DOCUMENTS	14- 29	22 1/4	- 3/8	-1.6
O DUPLEX PRODUCTS INC	8- 14	13	0	0.0
N ENNIS BUS. FORMS	5- 13	8 1/4	0	0.0
O GRAHAM MAGNETICS	9- 35	24 7/8	+3 1/8	+14.3

E X C H	71-72 RANGE (1)	CLOSE MAR 2 1972	WEEK NET CHNGE	WEEK PCT CHNGE
<b>COMPUTER SYSTEMS</b>				
O GRAPHIC CONTROLS	6- 15	11 7/8	+ 1/8	+1.0
N 3M COMPANY	96-141	140	- 1/4	-0.1
O MOORE BUS. FORMS	36- 48	47 3/4	- 1/2	-1.0
N NASHUA CORP	29- 55	55	+ 3/8	+0.6
O REYNOLDS & REYNOLD	37- 77	37 1/4	- 1/4	-0.6
O STANDARD REGISTER	14- 23	19 1/4	+ 1/2	+2.6
O TAB PRODUCTS CO	8- 17	14 1/2	+ 1/2	+3.5
N UARCO	23- 34	26 3/4	- 1/4	-0.9
A WABASH MAGNETICS	5- 10	9 1/2	- 1/4	-2.5
N WALLACE BUS FORMS	18- 26	24 3/8	+ 7/8	+3.7
<b>COMPUTER SYSTEMS</b>				
N BURROUGHS CORP	105-171	169	- 3/4	-0.4
N COLLINS RADIO	10- 20	15 3/8	-1 1/4	-7.5
N CONTROL DATA CORP	34- 83	59 1/4	+1 1/8	+1.9
O DATA GENERAL CORP	19- 80	76 3/4	+2	+2.6
O DIGITAL COMP CONTROL	4- 24	18 3/4	-3 1/4	-14.7
N DIGITAL EQUIPMENT	53- 95	94 7/8	+4 7/8	+5.4
N ELECTRONIC ASSOC.	5- 9	8 1/2	- 1/4	-2.8
A ELECTRONIC ENGINEER.	5- 14	11 3/4	- 3/8	-3.0
N FOXBORO	25- 46	36 3/4	+ 3/4	+2.0
O GENERAL AUTOMATION	9- 26	25 1/2	+2 1/4	+9.6
N HEWLETT-PACKARD CO	30- 56	56 3/8	+2 7/8	+5.3
N HONEYWELL INC	83-155	153 1/2	+4	+2.6
N IBM	284-376	376 1/4	+11 1/2	+3.1
O INTERDATA INC	6- 11	10	0	0.0
N NCR	25- 49	33 1/4	+2 3/4	+9.0
N RAYTHEON CO	27- 46	43 1/2	-2 1/8	-4.6
N SPERRY RAND	23- 38	37 5/8	+ 1/2	+1.3
A SYSTEMS ENG. LABS	7- 18	15 1/2	+4	+34.7
N VARIAN ASSOCIATES	11- 18	16	+ 1/8	+0.7
N VICTOR COMPTOMETER	12- 27	17 5/8	+2 5/8	+17.5
N WANG LABS.	29- 50	36 1/2	-2 3/8	-6.1
N XEROX CORP	85-139	138 7/8	+4 7/8	+3.6
<b>LEASING COMPANIES</b>				
A BOOTHE COMPUTER	11- 27	12 7/8	-1 3/4	-11.9
O BRESNAHAN COMP.	2- 4	3	- 1/8	-4.0
O COMPUTER EXCHANGE	1- 9	2 1/8	+ 1/4	+13.3
A COMPUTER INVSTRS GRP	7- 14	12 1/2	+ 1/2	+4.1
N DPF INC	8- 19	11 1/8	+ 1/4	+2.2
O DATRONIC RENTAL	2- 4	3 3/8	- 1/8	-3.5
A DCL INC	5- 13	8 3/4	- 1/8	-1.4
A DEARBORN-STORM	12- 23	21 3/4	+1 1/4	+6.0
A DPA, INC.	4- 9	6 1/4	0	0.0
A GRANITE MGT	7- 13	8 7/8	0	0.0
A GREYHOUND COMPUTER	7- 11	9 7/8	+ 1/8	+1.2
N LEASCO CORP	16- 26	22 3/4	+1 5/8	+7.6
O LECTRO MGT INC	2- 5	2 1/2	- 1/8	-4.7
O NCC INDUSTRIES	3- 11	10 1/2	+1 3/8	+15.0
A ROCKWOOD COMPUTER	3- 9	6 1/2	+ 1/2	+8.3
O SYSTEMS CAPITAL	3- 7	7 3/8	+1 5/8	+28.2
N U.S. LEASING	16- 44	43 3/4	+ 5/8	+1.4

EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE  
L=NATIONAL EXCHANGE; O=OVER-THE-COUNTER  
P=PHIL-BALT-WASH  
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## Computer Stocks Trading Index



## Earnings Reports

<b>MARSHALL INDUSTRIES</b>		
Six Months Ended Nov. 30		
	1971	1970
Shr Ernd	.....	\$.12
Revenue	\$9,919,000	a7,923,000
Loss Disc		
Op	914,000	96,000
Spec Chg	b11,383,000	.....
Earnings (Loss)	(12,069,000)	105,000

a-Restated to reflect discontinued operations. b-Write-down of equipment and assets employed only in the discontinued Data Systems Division, and write-down in the value of 51,920 shares of Control Data Corp. common stock, and write-down of the value of land in Orange County, Calif., to present market value.

<b>DPA</b>		
Year Ended Nov. 30		
	1971	1970

Shr Ernd	.....	\$.58
Revenue	\$34,568,000	30,584,000
Spec Chg	a6,911,000	.....
Earnings (Loss)	(10,460,000)	1,417,000

a-Provision for additional depreciation.

<b>LOGICON</b>		
Nine Months Ended Dec. 31		
	1971	1970

Shr Ernd	\$.42	\$.37
Revenue	8,099,022	7,117,436
Earnings	365,579	317,007

On a fully diluted basis, per-share earnings were 41 cents a share in 1971 and 36 cents a share in 1970.

<b>ANDERSON JACOBSON</b>		
Three Months Ended Dec. 31		
	1971	1970

Shr Ernd	\$.01	.....
Revenue	1,113,054	\$711,478
Earnings	34,329	6,951
9 Mo Shr	.....	.....
Revenue	3,129,505	1,609,847
Earnings (Loss)	110,300	(116,556)

<b>HAZELTINE</b>		
Year Ended Dec. 31		
	a1971	1970

Shr Ernd	.....	\$.52
Revenue	\$36,231,958	59,418,160
Earnings		
(Loss)	(819,541)	1,027,879

a-Preliminary.  
The above figures do not include effect of settlement with Zenith Radio Corp., which will be shown in the audited financial statements as an adjustment to retained earnings.

<b>ADVANCED MEMORY SYSTEMS</b>		
Three Months Ended Dec. 31		
	1971	1970

Revenue	\$1,515,544	\$314,710
Loss	325,793	330,679

<b>PERTEC</b>		
Three Months Ended Dec. 31		
	1971	a1970

Shr Ernd	\$.18	\$.15
Revenue	6,113,000	5,211,000
Earnings	570,000	443,000
6 Mo Shr	.38	.30
Revenue	11,714,000	10,020,000
Earnings	1,174,000	857,000

a-Restated to reflect rental income.

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Norman Andrews, Corporate Director of Data Management, Emerson Electric Company, St. Louis.

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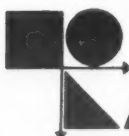
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**APPLIED DATA RESEARCH**

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